APPENDIX A

Ontario Hydro Field Data Sheets

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant		Train Ontario Hydro	
Sampling Location Inlet		Run 1	Cond. 1
Date 11-16-99	Start time 0800	Stop time 1039	Duration 125 min
Dimensions ft	Nozzle Diameter .2443 in.	Initial Leak rate 0.001 @ 15 "Hg	
PTCF 0.84	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 6 "Hg
ΔH @ 1.940	Static press. +4.5 "H_2O	Operator MCD	Kf 2.327

Point	Clock Time	Dry gas meter reading ft^3	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
E5	0800	786.098	0.85	1.98	306	258	261	59	74	71	5	299
E4	0805	789.9	0.71	1.65	309	253	260	53	75	72	4	296
E3	0810	793.1	0.75	1.74	310	250	251	51	78	73	4	292
E2	0815	796.4	0.80	1.85	311	250	248	50	81	74	4	285
E1	0820	800.1	0.81	1.88	312	250	244	51	84	75	4	276
STOP	0825	803.306	PREMOVE LEAK CHECK 0.004 at 6"Hg						POST MOVE 0.005 @ 6"Hg			
D5	0834	803.415	0.77	1.78	312	255	246	58	83	77	4	258
D4	0839	806.2	0.68	1.57	314	256	241	51	85	78	4	254
D3	0844	809.7	0.59	1.37	315	248	251	50	86	78	3.5	249
D2	0849	812.7	0.53	1.23	315	250	257	50	87	79	3.5	246
D1	0854	815.6	0.51	1.18	315	249	249	50	88	80	3.5	243
STOP	0859	818.618	PREMOVE 0.002 @ 6"Hg				POST MOVE 0.003 "Hg @ 6"Hg					
C5	0905	818.719	0.84	1.95	312	254	249	57	87	81	4	245
C4	0910	822.2	0.77	1.67	315	255	248	52	88	81	4	246
C3	0915	825.6	0.48	1.11	315	248	242	51	90	82	3.5	248
C2	0920	828.5	0.36	0.83	315	250	257	51	90	82	3.0	249
C1	0925	831.0	0.38	0.88	315	249	257	53	90	83	3.0	250
STOP	0930	833.492	PREMOVE 0.005 @ 6"Hg				POST MOVE 0.004 @ 6"Hg					
B5	0938	833.578	0.36	0.83	309	254	244	60	88	84	3.0	251
B4	0943	836.0	0.09	0.21	312	253	253	56	89	84	2.0	251
B3	0948	837.44	0.19	0.44	314	250	255	58	88	84	2.0	250
B2	0953	839.2	0.36	0.84	315	249	249	58	89	85	3.0	250
B1	0958	841.6	0.40	0.93	315	250	244	57	91	85	3.0	250
STOP	1003	~~PREMOVE~~ 844.160	PREMOVE 0.003 @ 6"Hg				POST MOVE 0.005 @ 6"Hg					
A5	1014	844.250	0.11	0.25	306	250	247	68	91	87	3.5	255
A4	1019	846.0	0.24	0.56	312	251	253	64	92	88	2.5	256
A3	1024	848.0	0.05	0.11	315	247	254	62	93	88	1.5	257
A2	1029	849.21	0.36	0.84	317	252	246	64	93	89	3.0	257

Console # A161365	Pitot tube leak check (+)	Nozzle Calibration: .245 .244 .244
Filter # Q0145	Pitot tube leak check (-)	
Comments		

MOISTURE AND IMPINGER CATCH DATA SHEET

(ONTARIO- HYDRO)

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100	M	869.3	735.0	134.3
2	KCl	100	M	784.9	738.2	46.7
3	KCl	100	G/S	762.5	750.4	12.1
4	HNO_3 / H_2O_2	100	M	627.7	619.1	8.6
5	KMnO4 / H_2SO_4	100	M	767.1	766.0	1.1
6	KMnO4 / H_2SO_4	100	M	747.0	747.6	-0.6
7	KMnO4 / H_2SO_4	100	G/S	642.7	643.8	-1.1
8	Silica Gel	~300g	M	936.2	923.2	13.0
9						
10						
					Total Impinger Weight Gain (Wc)	214.1 g

Vf	Final Meter Volume		Ft^3
Vi	Initial Meter Volume		Ft^3
DGMCF	Dry Gas Meter Correction Factor		
Tm	Average Meter Temp °F +460	544	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	68.622	Ft^3
Pm	Meter Pressure (barometric pressure)	29.7	"Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(68.622\ ft^3)(29.7\ "Hg)}{(544\ °R)} = 66.088\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(214.1\ g) = 10.106\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{\cancel{66.088}\ 10.106\ ft^3}{10.106\ ft^3 + 66.088\ ft^3} = 0.132$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant		Train Ontario Hydro	
Sampling Location Inlet		Run 1	Cond. 1
Date 11-16-99	Start time 0800	Stop time 1039	Duration 125 min.
Dimensions ft	Nozzle Diameter .2443 in.	Initial Leak rate 0.001 @ 15 "Hg	
PTCF 0.841	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 6 "Hg
ΔH @ 1.940	Static press. -4.5 "H_2O	Operator MLA	Kf 2.327

Point	Clock Time	Dry gas meter reading ft^3	ΔP " H_2O	ΔH "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
A1	1034	851.55	0.58	1.34	319	252	245	61	94	89	~~2.0~~ 3.5	259
STOP	1039	854.698										
AVG		68.213	0.500	1.160	312.9					84.1		

0.673 = $\sqrt{\Delta P}$ avg.

Console # A161365	Pitot tube leak check (+)	Nozzle Calibration: .245 .244 .244
Filter # Q 0145	Pitot tube leak check (-)	
Comments % ISO - 99.9		

MOISTURE AND IMPINGER CATCH DATA SHEET

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
					Total Impinger Weight Gain (Wc)_____g	

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	Ft^3
Pm	Meter Pressure (barometric pressure)	"Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)\ (\_\_\_\_\_\ ft^3)(\ \_\_\_\_\_\ "Hg)}{(\_\_\_\_\_\ °R)} = \_\_\_\_\_\ ft^3$$

Vw(std) = Volume of Water Vapor = .0472(Wc) = .0472(_____g) = _____ft^3

$$Bws = Moisture\ Fraction = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{\_\_\_\_\_\ ft^3}{\_\_\_\_\_\ ft^3 + \_\_\_\_\_\ ft^3} = \_\_\_\_$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Pelican		Train Ontario Hydro	
Sampling Location Inlet		Run 2	Cond. 1
Date 11-16-99	Start time 1130	Stop time 1413	Duration 125 min
Dimensions ft	Nozzle Diameter 0.2443 in.	Initial Leak rate 0.010 @ 16 "Hg	
PTCF 0.841	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 7 "Hg
ΔH @ 1.940	Static press. +4.5 "H_2O	Operator MLD	Kf

Point	Clock Time	Dry gas meter reading ft³	ΔP "H_2O	ΔH "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp°F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
A5	1130	855.911	0.12	0.28	318	258	247	68	94	92	1.0	225
A4	1135	857.7	0	0.33	318	250	251	68	96	93	1.0	236
A3	1140	859.3	0.02	0.04	319	249	255	66	97	93	1.0	247
A2	1145	861.0	0.22	0.51	323	251	253	64	99	94	1.5	255
A1	1150	862.9	0.47	1.09	323	251	250	61	100	95	2.5	262
STOP	1155	865.582	PREMOVE 0.005 @ 6" Hg				POSTMOVE 0.001 @ 6" Hg					
B5	1203	865.695	0.33	0.76	321	253	241	67	101	97	2.0	274
B4	1208	868.1	0.01	0.02	323	252	253	61	103	97	1.0	273
B3	1213	869.8	0.25	0.58	324	248	258	61	102	98	2.0	271
~~B2~~ B2	1218	870.8	0.44	1.02	325	250	248	61	103	98	2.5	270
B1	1223	874.5	0.47	1.09	326	250	245	59	105	99	2	269
STOP	1228	877.304	PREMOVE 0.001 @ 6" Hg				POSTMOVE 0.003 @ 6" Hg					
C5	1236	877.402	0.84	1.95	323	255	250	68	104	100	4	264
C4	1241	881.1	0.77	1.79	324	251	249	58	106	100	4	262
C3	1246	884.6	0.58	1.34	324	250	250	57	108	100	3	259
C2	1251	887.75	0.35	0.81	325	250	253	59	109	101	2	257
C1	1256	890.2	0.44	1.02	325	249	252	63	108	102	2.5	256
STOP	1300	892.498	PREMOVE 0.001 @ 6" Hg				POSTMOVE					
D5	1307	892.556	0.73	1.69	323	255	243	68	105	102	3	256
D4	1312	895.9	0.65	1.51	320	252	250	61	108	102	3	254
D3	1317	899.2	0.63	1.46	324	249	254	60	109	102	3	253
D2	1322	902.4	0.55	1.27	325	250	252	60	110	103	3	252
D1	1327	905.5	0.55	1.27	325	250	249	62	110	103	3	251
STOP	1332	908.568	PREMOVE 0.003 @ 6" Hg				POSTMOVE 0.003 @ 6" Hg					
E5	1348	908.684	0.78	1.81	324	258	243	68	107	104	4	257
E4	1353	912.2	0.69	1.60	326	250	255	60	109	104	4	256
E3	1358	915.6	0.74	1.72	324	249	257	58	111	105	3.5	256
E2	1403	919.0	0.78	1.81	326	250	251	60	113	105	4	256

Console # A161365	Pitot tube leak check (+)	Nozzle Calibration: .245 .244 .244
Filter # Q-0114	Pitot tube leak check (-)	
Comments %Iso - 95.5		

MOISTURE AND IMPINGER CATCH DATA SHEET

(ONTARIO - HYDRO)

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100	M	898.1	726.1	172.0
2	KCl	100	M	765.8	740.8	25.0
3	KCl	100	C/S	738.9	733.3	5.6
4	HNO_3 / H_2O_2	100	M	660.2	653.6	6.6
5	$KMnO_4$ / H_2SO_4	100	M	653.8	652.8	1.0
6	$KMnO_4$ / H_2SO_4	100	M	632.0	632.4	-0.4
7	$KMnO_4$ / H_2SO_4	100	C/S	661.3	661.5	-0.2
8	Silica Gel	~300	M	926.0	913.4	12.6
9						
10						
					Total Impinger Weight Gain (Wc)	222.2 g

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	–
Tm	Average Meter Temp °F +460	562.6 °R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	71.080 Ft^3
Pm	Meter Pressure (barometric pressure)	29.7 "Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(71.080\ ft^3)(29.7\ "Hg)}{(562.6\ R)} = 66.192\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(222.2\ g) = 10.488\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{10.488\ ft^3}{10.488\ ft^3 + 66.192\ ft^3} = 0.134$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant			Train Ontario Hydro		
Sampling Location Inlet			Run 2	Cond. 1	
Date 11-16-99	Start time 1130	Stop time 1413	Duration 125 min		
Dimensions ft	Nozzle Diameter 0.2443 in.		Initial Leak rate 0.010 @ 16 "Hg		
PTCF 0.84	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 7 "Hg		
ΔH @ 1.940	Static press. +4.5 "H_2O	Operator MCD		Kf	

Point	Clock Time	Dry gas meter reading ft^3	ΔP "H_2O	ΔH "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
E1	1408	922.05	0.75	1.74	325	250	244	62	113	105	4	255
STOP	~~1410~~ 1413	926.958						[illegible]				
AVG		70.656	0.506	1.140	323.3					102.6		

0.676 $(\sqrt{\Delta P})$ avg.

Console # A161365	Pitot tube leak check (+)	Nozzle Calibration:	⊖ .245 ⦶ .244 ∅ .244
Filter # Q-014	Pitot tube leak check (−)		
Comments			

MOISTURE AND IMPINGER CATCH DATA SHEET

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
					Total Impinger Weight Gain (Wc)_____g	

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	Ft^3
Pm	Meter Pressure (barometric pressure)	"Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)\ (\_\_\_\_\_\ ft^3)(\ \_\_\_\_\_\ "Hg)}{(\_\_\_\_\_\ °R)} = \_\_\_\_\_\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(\_\_\_\_\_g) = \_\_\_\_\_ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{\_\_\_\_\_\ ft^3}{\_\_\_\_\_ft^3 + \_\_\_\_\_\ ft^3 = \_\_\_\_}$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant		Train Ontario Hydro	
Sampling Location Inlet		Run 3	Cond. 1
Date 11-16-99	Start time 1513	Stop time 1751	Duration 125 min.
Dimensions ft	Nozzle Diameter 0.2443 in.	Initial Leak rate 0.002 @ 15 "Hg	
PTCF 0.84	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 9 "Hg
ΔH @ 1.940	Static press. -4.5 "H_2O	Operator MLA	Kf

Point	Clock Time	Dry gas meter reading ft^3	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
E 5	1513	926.229	0.76	1.76	320	253	240	68	99	99	4	~~[illegible]~~ 22
E 4	1518	930.0	0.74	1.72	326	251	250	67	100	99	4	227
E 3	1523	933.4	0.69	1.60	326	249	259	59	102	99	4	236
E 2	1528	936.7	0.73	1.70	327	250	251	66	105	100	4	244
E 1	1533	940.2	0.85	1.97	327	250	242	61	107	100	4	250
STOP	1538	943.918	PREMOVE	0.002	@ 6" Hg		POSTMOVE	OKAY				
D 5	1548	943.965	0.69	1.60	326	256	252	68	105	101	4	262
D 4	1553	947.3	0.65	1.51	329	252	240	61	106	101	4	283
D 3	1558	950.6	0.47	1.09	328	252	248	60	106	101	3	283
D 2	1603	953.5	0.43	1.00	329	248	256	60	106	100	3	280
D 1	1608	956.2	0.46	1.07	329	250	256	61	106	100	3	278
STOP	1613	958.952	PREMOVE 0.005 @ 6" Hg			POSTMOVE 0.002 @ 6" Hg			~~106~~	~~100~~		~~279~~ MLA
C 5	1621	959.085	0.76	1.76	328	253	245	68	103	100	4	276
C 4	1626	962.5	0.61	1.41	330	253	256	65	106	100	4	274
C 3	1631	965.8	0.35	0.81	330	250	255	64	107	101	3	273
C 2	1636	968.3	0.34	0.79	331	249	248	65	107	101	2.5	272
C 1	1641	970.7	0.38	0.88	331	249	244	66	107	101	3	271
STOP	1646	973.337	PREMOVE	0.004	@ 6" Hg		POSTMOVE	0.002	@ 6" Hg			
B 5	1654	973.440	0.35	0.81	327	253	248	68	104	101	3	273
B 4	1659	976.0	0.07	0.16	332	254	253	68	105	101	1	~~[illegible]~~ 27
B 3	1704	977.5	0.22	0.51	335	250	252	68	104	101	2	273
B 2	1709	979.6	0.45	1.04	339	250	252	68	104	101	3	273
B 1	1714	982.0	0.41	0.95	340	250	248	65	106	101	3	272
STOP	1719	984.825	PREMOVE	0.002	@ 6" Hg		POSTMOVE	OKAY				
A 5	1726	984.878	0.01	0.02	335	252	249	66	103	101	1	270
A 4	1731	985.8	0	0	337	256	251	68	102	101	1	268
A 3	1736	986.3	0.5	0.11	341	249	252	68	101	100	1	266
A 2	1741	987.2	0.35	0.81	343	250	248	68	101	100	3	261

Console # 4161365	Pitot tube leak check (+)	Nozzle Calibration: ⊖ .245 ⊕ .244 ∅ .244
Filter # Q-0141	Pitot tube leak check (-)	
Comments Y 180 = 92.5		

MOISTURE AND IMPINGER CATCH DATA SHEET

(1 PLET)

Ontario – Hydro

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100	M	889.3	745.1	144.2
2	KCl	100	M	780.8	751.5	29.3
3	KCl	100	G/S	641.4	634.2	7.2
4	HNO_3 / H_2O_2	100	M	764.5	755.9	8.6
5	$KMnO_4$ / H_2SO_4	100	M	746.3	745.4	0.9
6	$KMnO_4$ / H_2SO_4	100	M	745.5	745.2	0.3
7	$KMnO_4$ / H_2SO_4	100	G/S	657.5	657.9	-0.4
8	Silica Gel	~300g	M	911.0	895.8	15.2
9						
10						
					Total Impinger Weight Gain (Wc)	205.3 g

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	562.2 °R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	66.160 Ft^3
Pm	Meter Pressure (barometric pressure)	29.7 "Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(66.160\ ft^3)(29.7\ "Hg)}{(562.2°R)} = 61.654\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(205.3\ g) = 9.690\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{9.690\ ft^3}{9.690\ ft^3 + 61.654\ ft^3} = 0.135$$

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RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant		Train Ontario Hydro	
Sampling Location Inlet		Run 3	Cond. 1
Date 11-16-99	Start time 1513	Stop time 1751	Duration 125 min.
Dimensions ft	Nozzle Diameter 0.2443 in.	Initial Leak rate 0.002 @ 15 "Hg	
PTCF 0.84	DGMCF 1.006	Bar Press. 29.7 "Hg	Final leak rate 0.002 @ 9 "Hg
ΔH @ 1.940	Static press. +4.5 "H_2O	Operator MCD	Kf

Point	Clock Time	Dry gas meter reading ft^3	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp°F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
A1	1746	989.5	0.55	1.27	348	250	248	58	101	99	3.5	254
STOP	1751	992.790										
AVG		65.765	0.472	1.054	331.6					102.2		

0.648 = ($\sqrt{\Delta P}$) avg.

Console # A161365	Pitot tube leak check (+)	Nozzle Calibration: ⊖ .245 ⦶ .244 ∅ .244
Filter #	Pitot tube leak check (-)	
Comments		

14 6.5

MOISTURE AND IMPINGER CATCH DATA SHEET

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
					Total Impinger Weight Gain (Wc)_____g	

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	Ft^3
Pm	Meter Pressure (barometric pressure)	"Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)\ (\_\_\_\_\_\ ft^3)(\_\_\_\_\_\ "Hg)}{(\_\_\_\_\_\ °R)} = \_\_\_\_\_\ ft^3$$

Vw(std) = Volume of Water Vapor = .0472(Wc) = .0472(_____g) = _____ft^3

$$Bws = Moisture\ Fraction = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{\_\_\_\_\_\ ft^3}{\_\_\_\_\_\ ft^3 + \_\_\_\_\_\ ft^3} = \_\_\_\_$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name: Reliant Energy - Limestone		Train: OH	
Sampling Location: Outlet		Run: 1	Cond. 1
Date: 11/16/99	Start time: 0818	Stop time: 1023	Duration: 125 min
Dimensions: ft	Nozzle Diameter: 0.198 in.	Initial Leak rate: 0.005 @ 10 "Hg	
PTCF: 0.840	DGMCF: 0.979	Bar Press.: 29.7 "Hg	Final leak rate: 0.002 @ 6 "Hg
ΔH @: 1.974	Static press.: 1.6 "H_2O	Operator: AO	Kf: 1.14

Point	Clock Time	Dry gas meter reading ft³	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Dry Gas meter temp °F Outlet	Vacuum "Hg	Transfer Line
1	(AO) 0818 ~~0814~~	287.360	0.96	1.09	136	264	264	65	68	66	4	274
1	0823	290.17	0.96	1.09	136	265	264	64	75	68	4	268
1	0828	292.94	0.98	1.13	136	264	264	66	77	68	4	268
1	0833	295.80	0.98	1.13	136	266	264	66	80	69	4	268
1	0838	298.69	0.98	1.13	137	265	264	64	80	69	4	264
2	0843	301.55	1.1	1.27	138	264	264	51	82	71	4	260
2	0848	304.54	1.1	1.27	138	264	263	51	83	71	4	254
2	0853	307.54	1.1	1.28	138	264	264	52	83	72	4	255
2	0858	310.56	1.1	1.28	138	264	263	51	84	73	4	259
2	0903	313.52	1.0	1.16	138	263	264	51	84	74	4	261
3	0908	316.49	1.0	1.16	138	263	264	53	85	75	4	265
3	0913	319.30	1.1	1.27	139	263	264	54	86	75	4	262
3	0918	322.37	1.1	1.27	138	263	264	55	86	76	4	268
3	0923	325.73	1.1	1.27	138	263	264	55	87	76	4	269
3	0928	328.33	1.1	1.27	138	261	264	56	87	77	4	269
4	0933	331.56	1.0	1.16	140	262	264	57	87	77	4	269
4	0938	334.27	0.95	1.11	140	261	264	57	88	78	4	268
4	0943	337.10	0.95	1.11	140	262	264	59	88	78	4	266
4	0948	339.95	0.96	1.12	140	261	264	61	89	78	4	263
4	0953	342.82	0.92	1.08	141	263	264	62	89	79	4	260
5	0958	345.62	0.90	1.05	141	263	264	63	89	79	4	257
5	1003	348.37	0.82	0.96	141	263	264	64	90	80	4	256
5	1008	351.01	0.79	0.92	141	263	264	63	90	80	4	255
5	1013	353.63	0.83	0.97	141	264	265	63	90	80	4	257
5	1018	356.33	0.86	1.01	141	264	265	63	90	81	4	259
Stop	1023	359.073	–	–	–	–	–	–	–	–	–	–
AVG.		71.713	0.985	1.142	138.7					79.7		

0.991 = $(\sqrt{\Delta P})_{avg}$

Console # A161391	Pitot tube leak check (+) good @ 4"	Nozzle Calibration:	⊖ 0.198 ⊕ 0.198 ⊘ 0.197
Filter # Q-0143	Pitot tube leak check (-) good @ 4"		
Comments: Fyrite @ 0416 %O_2 = 6.5 %CO_2 = 14.0			
%ISO = 98.5			

MOISTURE AND IMPINGER CATCH DATA SHEET

(ONTARIO - HYDRO)

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100	M	949.8	731.6	218.2
2	KCl	100	M	808.1	741.2	66.9
3	KCl	100	G/S	655.9	639.7	16.2
4	HNO_3/H_2O_2	100	M	757.1	753.3	3.8
5	$KMnO_4/H_2SO_4$	100	M	757.2	755.7	1.5
6	$KMnO_4/H_2SO_4$	100	M	748.7	747.9	0.8
7	$KMnO_4/H_2SO_4$	100	G/S	656.9	657.0	-0.1
8	Silica Gel	~300g	M	1025.7	1004.9	20.8
9						
10						
					Total Impinger Weight Gain (Wc)	328.1 g

Vf	Final Meter Volume		Ft^3
Vi	Initial Meter Volume		Ft^3
DGMCF	Dry Gas Meter Correction Factor		
Tm	Average Meter Temp °F +460	539.7	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	70.207	Ft^3
Pm	Meter Pressure (barometric pressure)	29.7	"Hg

Orsat/Fyrite Results			0840
%CO		%N2	80
%CO2	~~8~~ 12	%H2	
%O2	8	%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(70.207\ ft^3)(29.7\ "Hg)}{(539.7\ °R)} = 68.153\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(328.1\ g) = 15.486\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{15.486\ ft^3}{15.486\ ft^3 + 68.153\ ft^3} = 0.185$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name: Reliant Energy		Train: OH	
Sampling Location: Outlet		Run: 2	Cond.: 1
Date: 11/16/99	Start time: 1138	Stop time: 1401	Duration: 125 min
Dimensions: ft	Nozzle Diameter: 0.198 in.	Initial Leak rate: 0.005 @ 15 "Hg	
PTCF: 0.84	DGMCF: 0.979	Bar Press.: 29.7 "Hg	Final leak rate: 0.000 @ 5 "Hg
ΔH @: 1.974	Static press.: 1.6 "H_2O	Operator: AO	Kf

Point	Clock Time	Dry gas meter reading ft³	ΔP "H_2O	ΔH "H_2O	Stack temp °F	Probe temp. °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Dry Gas meter temp °F Outlet	Vacuum "Hg	Transfer Line
1	1138	360.444	0.90	1.04	141	265	266	66	82	80	4	267
1	1143	363.12	0.94	1.09	141	264	266	64	84	80	4	269
1	1148	365.82	0.94	1.09	141	264	266	61	86	80	4	269
1	1153	368.53	0.92	1.08	141	264	266	58	88	80	4	268
* 1	1158	371.23	0.92	1.08	141	264	266	59	90	80	4	266
2	1208	376.77	1.1	1.29	141	264	266	60	92	81	4	263
2	1213	379.76	1.15	1.35	141	264	265	60	93	82	4.5	262
2	1218	382.86	1.15	1.35	140	264	266	60	94	83	4.5	261
2	1223	385.93	1.10	1.30	141	261	266	60	95	83	4.5	261
~~2~~	1228	388.952	Port Change at inlet									
3	1241	388.952	1.15	1.35	141	261	265	64	88	83	4.5	259
3	1246	392.01	1.10	1.30	141	263	265	63	92	84	4.5	257
3	1251	395.04	1.10	1.30	141	263	264	62	93	84	4.5	257
3	1256	398.15	1.10	1.30	141	264	265	63	95	84	4.5	258
3	1301	401.15	1.15	1.36	140	262	266	63	96	85	4.5	259
stop	1306	404.20	Port Change at Inlet									
4	1311	404.20	1.2	1.40	140	263	265	67	92	85	4.5	259
4	1316	407.38	1.15	1.36	141	264	265	66	94	85	4.5	257
4	1321	410.49	1.15	1.36	141	264	265	65	95	85	4.5	256
4	1326	413.59	1.15	1.36	141	266	266	66	97	86	4.5	259
4	1331	416.70	1.15	1.37	141	263	265	67	98	87	4.5	261
5	1336	419.82	0.87	1.04	141	263	265	67	99	88	4	262
5	1341	422.56	0.87	1.04	141	263	266	66	99	89	4	259
5	1346	425.30	0.82	0.98	141	264	266	65	99	89	4	258
5	1351	427.91	0.80	0.95	142	264	265	64	99	89	4	256
5	1356	430.55	0.80	0.95	142	265	267	63	99	89	4	254
stop	1401	433.194	-	-	-	-	-	-	-	-	-	-
AVG →		72.780	1.028	1.212	140.9					88.7		

Console # A161397	Pitot tube leak check (+) good @ 3	Nozzle Calibration:	⊖ 0.198 ⊘ 0.198 ⊘ 0.197
Filter # Q-0142	Pitot tube leak check (-) good @ 3		

Comments: * had to miss one reading - went to help with port change at inlet - AO

% Isok = 97.5

$(\sqrt{\Delta P})_{avg}$ = 1.011

MOISTURE AND IMPINGER CATCH DATA SHEET

0-14

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100		938.8	~~716.4~~ 724.7	214.1
2	KCl	100		786.5	717.5	69.0
3	KCl	100		748.5	716.4	32.1
4	HNO_3 / H_2O_2	100		619.2	608.3	10.9
5	$KMnO_4$ / H_2SO_4	100		738.9	732.7	6.2
6	$KMnO_4$ / H_2SO_4	100		737.7	736.6	1.1
7	$KMnO_4$ / H_2SO_4	100		751.4	749.7	1.7
8	Silica Gel	~300g		1012.0	997.0	15.0
9						
10						
					Total Impinger Weight Gain (Wc)	350.1 g

Vf	Final Meter Volume		Ft^3
Vi	Initial Meter Volume		Ft^3
DGMCF	Dry Gas Meter Correction Factor		
Tm	Average Meter Temp °F +460	548.7	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	71.252	Ft^3
Pm	Meter Pressure (barometric pressure)	29.7	"Hg

Orsat/Fyrite Results			1250
%CO		%N2	80
%CO2	12	%H2	
%O2	8	%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(71.252\ ft^3)(29.7\ "Hg)}{(548.7\ R)} = 68.033\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(350.1\ g) = 16.525\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{16.525\ ft^3}{16.525\ ft^3 + 68.033\ ft^3} = 0.195$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name: Reliant Energy		Train: OH	
Sampling Location: Outlet		Run: 3	Cond.: 1
Date: 11/16/99	Start time: 1500	Stop time: 1728	Duration: 125 min
Dimensions: ft	Nozzle Diameter: 0.215 in.	Initial Leak rate: 0.005 @ 15 "Hg	
PTCF: 0.84	DGMCF: 0.979	Bar Press.: 29.1 "Hg	Final leak rate: 0.000 @ 7 "Hg
ΔH @: 1.974	Static press.: 1.6 "H_2O	Operator: AO	Kf: 1.65

Point	Clock Time	Dry gas meter reading ft³	ΔP "H_2O	ΔH "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Dry Gas meter temp °F Outlet	Vacuum "Hg	Train line
1	1500	434.742	0.96	1.58	139	265	264	67	90	90	5	250
1	1505	437.66	0.96	1.58	139	264	265	64	93	91	5	256
1	1510	441.03	0.95	1.57	138	264	265	64	97	91	5	255
1	1515	444.45	0.95	1.57	138	265	266	65	100	92	5	256
1	1520	448.85	0.92	1.52	138	265	266	65	104	94	5	257
2	1525	452.70	1.00	1.65	137	264	266	65	106	95	5	256
2	1530	455.	1.00	1.65	137	263	266	65	107	96	5	256
2	1535	458.	1.00	1.65	137	262	266	66	108	97.	5	256
2	1540	461.73	1.00	1.65	137	261	265	67	109	98	5	256
2	1545	465.19	0.94	1.60	137	261	265	63	110	99	5	255
3	1550	468.66	0.95	1.62	137	261	266	60	110	100	5	256
3	1555	472.11	0.96	1.58	138	260	265	55	108	100	5	256
3	1600	475.53	0.96	1.58	139	261	266	55	107	99	5	252
3	1605	479.97	0.96	1.58	139	262	266	54	105	99	5	251
Stop ~~3~~	1610	482.290	Help change ports at inlet									
3	1624	482.290	0.99	1.64	137	262	265	67	96	93	5	257
4	1629	487.80	1.00	1.65	137	263	264	54	99	94	5	257
4	1634	489.20	0.88	1.46	137	263	264	51	101	93	5	257
4	1639	492.60	0.88	1.46	137	261	264	53	101	93	5	257
4	1644	495.75	0.90	1.49	139	260	264	54	101	93	5	257
Stop ~~4~~	1649	499.187	Change ports at Inlet									
4	1658	499.187	0.91	1.52	140	260	264	66	93	89	5	255
5	1703	502.60	0.75	1.25	140	256	263	57	95	89	5	254
5	1708	505.72	0.77	1.29	138	252	264	57	95	89	5	251
5	1713	508.88	0.77	1.29	137	252	263	56	93	87	5	251
5	1718	512.04	0.84	1.40	137	253	263	56	93	86	5	253

Console #: A16397	Pitot tube leak check (+): good @ 3	Nozzle Calibration: 0.215 0.215 0.215
Filter #: G-0117	Pitot tube leak check (-): good @ 3	
Comments: 1630 - ~~No~~ Steam plume out of stack is much smaller than before, not as much moisture		
%Iso: 99.4		

MOISTURE AND IMPINGER CATCH DATA SHEET

6-H

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1	KCl	100	M	1005.1	747.4	257.7
2	KCl	100	M	819.1	730.6	88.5
3	KCl	100	G/S	766.8	746.2	20.6
4	HNO_3 / H_2O_2	100	M	629.8	623.1	6.7
5	$KMnO_4$ / H_2SO_4	100	M	752.1	751.8	0.3
6	$KMnO_4$ / H_2SO_4	100	M	755.1	754.0	1.1
7	$KMnO_4$ / H_2SO_4	100	G/S	639.3	640.4	-1.1
8	SILICA GEL	~300g	M	856.6	837.9	18.7
9						
10						
					Total Impinger Weight Gain (Wc)	342.5 g

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	555.1 °R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	82.440 Ft^3
Pm	Meter Pressure (barometric pressure)	29.7 "Hg

Orsat/Fyrite Results			1516
%CO		%N2	80
%CO2	12	%H2	
%O2	8	%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)(82.440\ ft^3)(29.7\ "Hg)}{(555.1\ °R)} = 77.802\ ft^3$$

$$Vw(std) = \text{Volume of Water Vapor} = .0472(Wc) = .0472(342.5\ g) = 18.526\ ft^3$$

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{18.526\ ft^3}{18.526\ ft^3 + 77.802\ ft^3} = 0.192$$

Revised by RCC June 23, 1998

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name: Reliant Energy		Train: OH	
Sampling Location: Outlet		Run: 3	Cond. 1
Date: 11/16/99	Start time: 1500	Stop time: 1728	Duration: 125 min
Dimensions ft	Nozzle Diameter: 0.215 in.	Initial Leak rate: 0.005 @ 15 "Hg	
PTCF: 0.84	DGMCF: 0.979	Bar Press.: 29.7 "Hg	Final leak rate: 0.000 @ 7 "Hg
ΔH @: 1.974	Static press.: 1.6 "H_2O	Operator: AO	Kf

Point	Clock Time	Dry gas meter reading ft^3	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Dry Gas meter temp °F Outlet	Vacuum "Hg	Trans Line
5	1723	515.27	0.73	1.22	138	249	263	58	94	86	5	255
Stop	1728	518.450	–	–	–	–	–	–	–	–	–	
Avg →		84.208	0.817	1.522	132.8					45.1		

0.815

$\sqrt{\Delta P}$ 0.9

Console # A161397	Pitot tube leak check (+) good @ 3	Nozzle Calibration: ⊖ 0.215 ⊕ 0.215 ⊘ 0.215
Filter #	Pitot tube leak check (−) good @ 3	
Comments		

MOISTURE AND IMPINGER CATCH DATA SHEET

Impinger number	Impinger solution	Approx. volume (ml)	Impinger Configuration	Final Weight (g)	Tare Weight (g)	Net Gain (g)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
					Total Impinger Weight Gain (Wc)_____g	

Vf	Final Meter Volume	Ft^3
Vi	Initial Meter Volume	Ft^3
DGMCF	Dry Gas Meter Correction Factor	
Tm	Average Meter Temp °F +460	°R
Vm	Metered Gas Volume (Vf-Vi)(DGMCF)	Ft^3
Pm	Meter Pressure (barometric pressure)	"Hg

Orsat/Fyrite Results			
%CO		%N2	
%CO2		%H2	
%O2		%CH	

$$Vm\ (std) = \frac{(17.64)(Vm)(Pm)}{Tm} = \frac{(17.64)\ (\_\_\_\_\_\ ft^3)(\ \_\_\_\_\_\ "Hg)}{(\_\_\_\_\_\ °R)} = \_\_\_\_\_\ ft^3$$

Vw(std) = Volume of Water Vapor = .0472(Wc) = .0472(_____g) = _____ft^3

$$Bws = \text{Moisture Fraction} = \frac{Vw(std)}{Vw(std) + Vm(std)} = \frac{\_\_\_\_\_\ ft^3}{\_\_\_\_\_\ ft^3 + \_\_\_\_\_\ ft^3 = \_\_\_\_}$$

Revised by RCC June 23, 1998

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO.

SIGNATURE [signature] DATE 11/16/99 CHECKED DATE

PROJECT RELIANT (HG) 80331.001 JOB NO.

SUBJECT Recovery Notes SHEET 1 OF 3 SHEETS

INLET - RUN 1

- Impingers #1-3 req'd 2 squirts (~3 mL per squirt) each to retain "purple" color, actually more of a brownish color. No hydroxylamine req'd, approximately 10 drops per impinger.
- Light loading on filter (yellowish). [#Q-0145]
- Impingers #5-7 required no hydroxylamine.

OUTLET - RUN 1

- Impingers #1-3 req'd only 1 squirt each (~3 mL) to retain purple color (brown). No hydroxylamine req'd.
- Very light loading on filter (yellowish). [#Q-0143]
- Impingers #5-7 required no hydroxylamine.

Inlet - Run 2

- Impingers #1-3 took only 1 squirt each to retain purple color. 1st impinger is tan in color, 2nd is brown, 3rd is purple. (after knocking off). Imp's 2-3 took 5 drops each of hydroxylamine.
- Filter is identical to Run-1 (inlet). [#Q-0116]
- Impingers #5-7 took 30 drops hydroxylamine each.

10-88-30702

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO.

SIGNATURE [signature] DATE 11/16/99 CHECKED DATE

PROJECT RELPANT (LC) 8033.02.01 JOB NO.

SUBJECT RECOVERY NOTES SHEET 2 OF 3 SHEETS

OUTLET - RUN 2

- Impingers #1-3 req'd 1 squirt (~3 ml) KMnO4 (5%) to retain "purple" color. Kept to a "muddy-purple".
- Filter is identical to Run-2. [#Q-0142]
- Impingers #5 & #6 req'd 10 drops each of hydroxylamine. #7 needed 50 drops.

Impingers #1 & #3 req'd 5 drops each of hydroxylamine.

Outlet - Run 3

- Filter identical to Runs 1 & 2 [#Q-0117]
- Impingers #1-3 needed only 1 squirt each (~3 ml each) of 5% KMnO4 to retain "purple" color.
- Impingers #5-7 needed 20 drops each of hydroxylamine.

10-88-30702

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. _____

SIGNATURE [signature] DATE 11/16/99 CHECKED _____ DATE _____

PROJECT Reliant (Hg) 80330.01 JOB NO. _____

SUBJECT Recovery Notes SHEET 3 OF 3 SHEETS

Inlet - RUN 3

- Filter identical to previous inlet sampling but loading is much greater.
- Impingers #1-3 required only 1 squirt per to maintain "purple" color. (~3 ml each). Color is more brown than purple.
- Impingers #5-7 needed 20 drops each of hydroxylamine.

1M

Limestone EGS
Mercury Testing
11/16/1999
Timeline

1A SCRUBBER DUCT

Actual Times

(0800-1030)

			Lignite	Fly Ash	Bottom Ash	Scrubber Slurry
Run 1	07:30 - 10:00	Sample # 1	8:00	8:00	8:00	9:30
		Sample # 2	8:45	9:00	9:00	11:30
		Sample # 3	9:15			13:30
		Sample # 4				15:30
(1130-)						
Run 2	10:45 - 13:15	Sample # 1	11:15	11:45	11:45	
		Sample # 2	12:00	12:45	12:45	
		Sample # 3	12:45			
( )						
Run 3	14:00 - 16:30	Sample # 1	14:30	14:30	14:30	
		Sample # 2	15:15	15:15	15:15	
		Sample # 3	16:00			

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO.

SIGNATURE [signature] DATE 11/16/99 CHECKED DATE

PROJECT Reliant (Hg) 803310.01 JOB NO.

SUBJECT Final wts. SHEET 1 OF 1 SHEETS

INLET RUN-2 FINAL WEIGHTS:

1	898.1
2	765.8
3	738.0
4	660.2
5	653.8
6	632.0
7	661.3
8	926.0

OUTLET - RUN 3

1	1005.1
2	819.1
3	766.8
4	629.8
5	752.1
6	755.1
7	639.3
8	856.6

10-88-30702

RADIAN INTERNATIONAL LLC

Velocity Profile

Facility: Reliant

Location: Input

Date: 11-15-99

Time: 1720

Initials:

Run No.:

%O_2: %CO_2: %N_2:

Duct Dimensions:

P_{bar}:

P_{static}: 4.5 inches H_2O

Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other	Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other
1-5	310	0.07	0°	3-4	321	0.662	0°
1-4	316	0	0°	3-3	322	0.550	0°
1-3	319	~~0.07~~ 0 MCD	0°	3-2	322	0.355	0°
1-2	321	0.45	~~90°~~ 100° MCD	3-1	323	0.42	0°
~~1-2~~	~~322~~	~~0~~	~~0°~~ MCD	4-5	322	0.83	10° CW
1-1	322	0.64	0°	4-4	322	0.73	0°
2-5	320	0.47	0°	4-3	323	0.59	0°
2-4	320	0.09	0°	4-2	323	0.53	0°
2-3	320	0.31	0°	4-1	323	0.55	0°
2-2	321	0.57	10° counterclockwise	5-5	322	0.831	0°
2-1	322	0.53	20° counterclockwise	5-4	323	0.770	0°
3-5	321	0.99	10° ~~MCD~~ CW	5-3	323	0.760	0°

Comments:

14'3"
- 30"
171.5
-30
141.5"

28.3"
per sec
pt 1 v
2 72.4
3 100.7
4 129.0
5 157.

RADIAN INTERNATIONAL LLC

Velocity Profile

Facility: Reliant

Location: Input

Date: 11-15-99

Time:

Initials:

Run No.:

% O_2: % CO_2: % N_2:

Duct Dimensions:

P_{bar}:

P_{static}:

Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other	Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other
5-2	324	0.810	0°				
5-1	324	0.820	10° CW				
	.6810						

Comments: .4637

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Page of

Plant Name Reliant		Train Moisture	
Sampling Location Inlet		Run	Cond.
Date 11-15-99	Start time	Stop time	Duration
Dimensions ft	Nozzle Diameter in.	Initial Leak rate _____ @ _____ "Hg	
PTCF	DGMCF	Bar Press. "Hg	Final leak rate _____ @ _____ "Hg
ΔH @	Static press. "H_2O	Operator	Kf

Point	Clock Time	Dry gas meter reading ft³	Δ P " H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
	1736	762.827	1.05					68	87	86	1.00	
	1751	771.190	1.05					60	90	87	1.00	
	1802	776.82	1.05					62	92	87	1.00	
	1814	783.750	1.05					63	93	88	1.00	
	~~1816~~ 1818	785.666							88.75			
		22.835										
		21.854										

Console #	Pitot tube leak check (+)	Nozzle Calibration: ⊖ ___ ⊕ ___ ∅ ___
Filter #	Pitot tube leak check (−)	
Comments		

RADIAN INTERNATIONAL LLC

SOURCE SAMPLING FIELD DATA SHEET

Plant Name Reliant Energy		Train MOISTURE	
Sampling Location Outlet		Run 1	Cond. 1
Date 11/15/99	Start time 1525	Stop time	Duration
Dimensions 14 ft	Nozzle Diameter NA in.	Initial Leak rate 0.002 @ 15 "Hg	
PTCF	DGMCF 0.989	Bar Press. "Hg	Final leak rate _____ @ _____ "Hg
ΔH @ 1.967	Static press. "H_2O	Operator AO	Kf NA

Point	Clock Time	Dry gas meter reading ft^3	Δ P "H_2O	Δ H "H_2O	Stack temp °F	Probe temp °F	Hotbox temp. °F	Impinger exit temp °F	Dry Gas meter temp °F Inlet	Outlet	Vacuum "Hg	
	1525	100.556		1.5		NA	NA	70	94	92	2.5	
	1531	104.83		1.5		NA	NA	67	95	93	2.5	
	1535	107.53		1.5		NA	NA	65	98	93	2.5	
Stop	1543	112.527		–	–	–	–	–	–	–	–	
		11.971		1.5	1348				94.2			
			√ΔP =	1.048								

Console # A161401	Pitot tube leak check (+) good @ 4	Nozzle Calibration:	⊖ NA ⦶ NA ⊘ NA
Filter # NA	Pitot tube leak check (-) good @ 3		
Comments			

RADIAN INTERNATIONAL LLC

Velocity Profile

Facility: Reliant Energy

Location: Outlet

Date: 11/15/99

Time: 1545-1550

Initials: AO

Run No.: Preliminary

%O_2: 8 %CO_2: 12 %N_2: 80

Duct Dimensions: 14'

P_{bar}: 29.65

P_{static}: +1.6

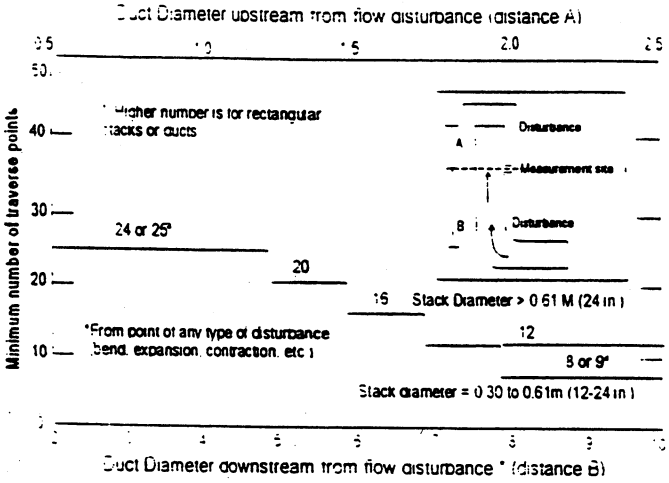
Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other	Traverse Point	Gas Temp. (°F)	ΔP (in. H_2O)	Other
1	136	1.1					
2	136	1.1					
3	134	1.2					
4	134	1.1					
5	134	1.0					

Comments: Single port traverse - Only one Accessible port

EPA Reference Method 1 Field Data Sheet

Plant Name Reliant Energy
Sampling Location FGD- Outlet
Date 11/16/99
Operator AC

Stack Diameter 14'
Sample Port Diameter 4"
Sample Port Depth 18"
Distance Upstream ~25'
Distance Downstream ~25'



Traverse Point Number	Number Traverse Points on a Diameter											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												95.8
24												98.9

Traverse Points	Distance of Pa
No	~~Distance from wall~~
1	24"
2	54"
3	84"
4	114"
5	144"
6	
7	
8	
9	
10	
11	
12	
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APPENDIX B

Laboratory Analytical Reports

RADIAN ANALYTICAL SERVICES
EPAS REPORT
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Work Order # 9911506

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG

Certified By Marcus Hyun
Date 12/20/99

Report Form	Analytical Batch ID	Pages From	Pages To
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12/17/99 14:31:19

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911506
Page 1

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Description
REL-1101	01A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1102	01B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1103	01C	COMPME00	Compositing for Metals
REL-1101/1102/1103	01D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1201	02A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1202	02B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1203	02C	COMPME00	Compositing for Metals
REL-1201/1202/1203	02D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1301	03A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1302	03B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1303	03C	COMPME00	Compositing for Metals
REL-1301/1302/1303	03D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1401	04A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab

WORK ORDER SUMMARY (Cont'd)

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911506

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Description
REL-1402	04B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1403	04C	COMPME00	Compositing for Metals
REL-1401/1402/1403	04D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1151	05A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1152	05B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1153	05C	COMPME00	Compositing for Metals
REL-1151/1152/1153	05D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1251	06A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1252	06B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1253	06C	COMPME00	Compositing for Metals
REL-1251/1252/1253	06D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1351	07A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1352	07B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab

WORK ORDER SUMMARY (Cont'd)

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911506
Page 3

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-1353	07C	COMPME00	Compositing for Metals
REL-1351/1352/1353	07D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
REL-1451	08A	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1452	08B	COMPME00	Compositing for Metals
		SHAREX00	Shared Split,VOA/Other Lab
REL-1453	08C	COMPME00	Compositing for Metals
REL-1451/1452/1453	08D COMPOSITE	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS
NIST 1633B	09A	DFMBTA00	40 CFR 266 App.IX (3.1)
		HGCBMA00	Mercury by CVAAS

WORK ORDER COMMENTS

Post digestion spikes not performed on all GFAAS analyses per Item 271 of the New York ELAP manual. Post digestion spikes were performed, as necessary, when recoveries for serial dilutions or matrix spikes for an analytical batch did not fall within recovery tolerances.

Mercury Digestion Batch: GD1G991210102000

The Nist 1633b SRM (certified at 0.141 mg/kg) was redigested via the same microwave and mercury digestions and reanalyzed in duplicate.

Actual Value #1 = 0.334 ug/Kg

Actual Value #2 = 0.201 ug/Kg

While these values are much closer to the certified value, they indicate some difficulty achieving accurate results for this SRM. NIST used ICP and ID-TIMS (not CVAA) to certify the Hg content of 1633b.

Fraction 9911506-09A was a digestion of the 1633b. The concentration determined was 1.03 mg/kg (0.143 ug/ 0.1389 g). The extra analyses mentioned above were performed to investigate our ability to analyze the 1633b.

STATE CERTIFICATIONS

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG
Method Mercury by SW-846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
NIST 1633B	9911506-09A	HGCBMA00	GMDG991207083000	AAZ4 91213133902
NIST 1633B	9911506-09A	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1101/1102/1103	9911506-01D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1101/1102/1103	9911506-01D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1151/1152/1153	9911506-05D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1151/1152/1153	9911506-05D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1201/1202/1203	9911506-02D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1201/1202/1203	9911506-02D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1251/1252/1253	9911506-06D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1251/1252/1253	9911506-06D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1301/1302/1303	9911506-03D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1301/1302/1303	9911506-03D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1301/1302/1303	9911506-03D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1351/1352/1353	9911506-07D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1351/1352/1353	9911506-07D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1401/1402/1403	9911506-04D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1401/1402/1403	9911506-04D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1451/1452/1453	9911506-08D	HGCBMA00	GMDG991207083000	AAZ4 91213133902
REL-1451/1452/1453	9911506-08D	HGCBMA00	GMDG991207083000	AAZ4 91213133902

RESULTS SUMMARY

Method BIF Hg, MW Digested Train

Test Code HGCBMA00

Project Sample ID:	NIST 1633B		NIST 1633B		REL-1101/1102-/1103		REL-1101/1102-/1103	
Lab ID:	9911506-09A		9911506-09A		9911506-01D COMPOS		9911506-01D COMPOS	
File ID:	Z4121313-49		Z4121313-50		Z4121313-27		Z4121313-28	
Date Collected:					11/16/99		11/16/99	
Date Prepared:	12/10/99		12/10/99		12/10/99		12/10/99	
Date Analyzed:	12/13/99 15:50:41		12/13/99 15:53:18		12/13/99 14:51:28		12/13/99 14:54:10	
Dilution Factor:	1		1		1		1	
Matrix:	Train-FRT		Train-FRT		Train-FRT		Train-FRT	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.144	0.00300	0.142	0.00300	0.0532	0.00300	0.0520	0.00300

RESULTS SUMMARY (Cont'd)

Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Project Sample ID:	REL-1151/1152-/1153		REL-1151/1152-/1153		REL-1201/1202-/1203		REL-1201/1202-/1203	
Lab ID:	9911506-05D COMPOS		9911506-05D COMPOS		9911506-02D COMPOS		9911506-02D COMPOS	
File ID:	Z4121313-41		Z4121313-42		Z4121313-29		Z4121313-30	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/10/99		12/10/99		12/10/99		12/10/99	
Date Analyzed:	12/13/99 15:29:01		12/13/99 15:31:42		12/13/99 14:56:52		12/13/99 14:59:36	
Dilution Factor:	1		1		1		1	
Matrix:	Train-FRT		Train-FRT		Train-FRT		Train-FRT	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.0228	0.00300	0.0208	0.00300	0.466	0.00300	0.457	0.00300

RESULTS SUMMARY (Cont'd)

Method B1F Hg, MW Digested Train
Test Code HGCBMA00

Project Sample ID:	REL-1251/1252-/1253		REL-1251/1252-/1253		REL-1301/1302-/1303		REL 1301/1302-/1303	
Lab ID:	9911506-06D COMPOS		9911506-06D COMPOS		9911506-03D COMPOS		9911506-03D COMPOS	
File ID:	Z4121313-43		Z4121313-44		Z4121313-31		Z4121313-32	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/10/99		12/10/99		12/10/99		12/10/99	
Date Analyzed:	12/13/99 15:34:23		12/13/99 15:37:06		12/13/99 15:02:20		12/13/99 15:05:06	
Dilution Factor:	1		1		1		1	
Matrix:	Train-FRT		Train-FRT		Train-FRT		Train-FRT	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.0189	0.00300	0.0207	0.00300	0.205	0.00300	0.204	0.00300

RESULTS SUMMARY (Cont'd)

Method BIF Hg, MW Digested Train

Test Code HGCBMA00

Project Sample ID:	REL-1301/1302-/1303		REL-1351/1352-/1353		REL-1351/1352-/1353		REL-1401/1402-/1403	
Lab ID:	9911506-03D COMPOS		9911506-07D COMPOS		9911506-07D COMPOS		9911506-04D COMPOS	
File ID:	Z4121313-33		Z4121313-45		Z4121313-46		Z4121313-37	
Date Collected:	11/16/99		11/16/99		11/16/99		11/17/99	
Date Prepared:	12/10/99		12/10/99		12/10/99		12/10/99	
Date Analyzed:	12/13/99 15:07:46		12/13/99 15:39:49		12/13/99 15:42:33		12/13/99 15:18:21	
Dilution Factor:	1		1		1		1	
Matrix:	Train-FRT		Train-FRT		Train-FRT		Train-FRT	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.205	0.00300	0.0300	0.00300	0.0318	0.00300	0.0140	0.00300

RESULTS SUMMARY (Cont'd)

Method BIF Hg, MW Digested Train

Test Code HGCBMA00

Project Sample ID:	REL-1401/1402-/1403		REL-1451/1452-/1453		REL-1451/1452-/1453			
Lab ID:	9911506-04D COMPOS		9911506-08D COMPOS		9911506-08D COMPOS			
File ID:	Z4121313-38		Z4121313-47		Z4121313-48			
Date Collected:	11/17/99		11/17/99		11/17/99			
Date Prepared:	12/10/99		12/10/99		12/10/99			
Date Analyzed:	12/13/99 15:20:59		12/13/99 15:45:16		12/13/99 15:48:00			
Dilution Factor:	1		1		1			
Matrix:	Train-FRT		Train-FRT		Train-FRT			
Units:	ug		ug		ug			
Report as:	received		received		received			
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.0165	0.00300	0.00283 J	0.00300	0.00115 J	0.00300		

12/17/99 14:31:19

INITIAL CALIBRATION

Work Order # 9911506

Page 13

Initial Calibration # Z4991213133900

Calibration Date 12/13/99 13:39:00

Sol'n #

Method Mercury by SW-846

Test Code HGCSWA00

Instrument Z4

Analyst RWG

Reviewer MOS

Analytes	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Correlation Coefficient
Mercury	0.000 0	0.0042016 0.0005	0.0092086 0.001	0.0180762 0.002	0.0359563 0.004	0.0875508 0.010	0.1697543 0.020	1.000

Specification Limits for correlation coefficient >0.995

DIGESTION BATCH SUMMARY

Digestion Batch # GMDG991207083000

Method 40 CFR 266 App.IX (3.1)
Test Code DFMBTA00

Extraction Start Date/Time 12/07/99 08:30:00
Extraction Stop Date/Time 12/09/99 15:00:00

Analyst HD
Reviewer PRS

Sample	Project Sample ID	Lab Sample ID	Sample Size g	Cleanup Method
1	REL-1101/1102/1103	9911506-01D	w.s	
2	REL-1201/1202/1203	9911506-02D	w.s	
3	REL-1301/1302/1303	9911506-03D	w.s	
4	REL-1401/1402/1403	9911506-04D	w.s	
5	REL-1151/1152/1153	9911506-05D	w.s	
6	REL-1251/1252/1253	9911506-06D	w.s	
7	REL-1351/1352/1353	9911506-07D	w.s	
8	REL-1451/1452/1453	9911506-08D	w.s	
9	NIST 1633B	9911506-09A	0.1389	
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Quality Control	Project Sample ID	Lab Sample ID	Sample Size g	Cleanup Method
Blank		BLK993650	w.s.	
Blank		BLK993651	w.s.	
Blank		BLK993651	w.s.	
Laboratory Control Sample		LCS995782	100	
Laboratory Control Sample Duplicate		LCSD995782	100	

ANALYSIS BATCH SUMMARY

Analysis Batch # AAZ4 91213133902

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991213133900
Calibration Date 12/13/99

Analysis Start Date/Time 12/13/99 13:39:00
Analysis Stop Date/Time 12/13/99 16:54:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1	12/13/99 13:40:15		S_0	Initial Calibration Blank	Z4121313-1
2	12/13/99 13:42:55		S_05	Initial Calibration Standard 1	Z4121313-2
3	12/13/99 13:45:35		S_1	Initial Calibration Standard 2	Z4121313-3
4	12/13/99 13:48:16		S_2	Initial Calibration Standard 3	Z4121313-4
5	12/13/99 13:50:57		S_4	Initial Calibration Standard 4	Z4121313-5
6	12/13/99 13:53:41		S_10	Initial Calibration Standard 5	Z4121313-6
7	12/13/99 13:56:25		S_20	Initial Calibration Standard 6	Z4121313-7
8	12/13/99 14:00:22		ICV	Initial Calibration Verification	Z4121313-8
9	12/13/99 14:03:04		ICB	Blank, Initial Calibration	Z4121313-9
22	12/13/99 14:37:55		CCV	Continuing Calibration Verification	Z4121313-22
23	12/13/99 14:40:36		CCB	Blank, Continuing Calibration	Z4121313-23
24	12/13/99 14:43:22		BLK993650	Blank, Method	Z4121313-24
25	12/13/99 14:46:03		LCS995782	Lab Control Sample	Z4121313-25
26	12/13/99 14:48:44		LCSD995782	Lab Control Sample Duplicate	Z4121313-26
27	12/13/99 14:51:28	REL-1101/1102/1103	9911506-01D	Sample	Z4121313-27
28	12/13/99 14:54:10	REL-1101/1102/1103	9911506-01D	Sample Duplicate	Z4121313-28
29	12/13/99 14:56:52	REL-1201/1202/1203	9911506-02D	Sample	Z4121313-29
30	12/13/99 14:59:36	REL-1201/1202/1203	9911506-02D	Sample Duplicate	Z4121313-30
31	12/13/99 15:02:20	REL-1301/1302/1303	9911506-03D	Sample	Z4121313-31
32	12/13/99 15:05:06	REL-1301/1302/1303	9911506-03D	Sample Duplicate	Z4121313-32
33	12/13/99 15:07:46	REL-1301/1302/1303	9911506-03D	Sample Duplicate	Z4121313-33
34	12/13/99 15:10:24	REL-1301/1302/1303	9911506-03D	Serial Dilutions	Z4121313-34
35	12/13/99 15:13:02	REL-1301/1302/1303	9911506-03D	Analytical Spike	Z4121313-35
36	12/13/99 15:15:41	REL-1301/1302/1303	9911506-03D	Analytical Spike Duplicate	Z4121313-36
37	12/13/99 15:18:21	REL-1401/1402/1403	9911506-04D	Sample	Z4121313-37
38	12/13/99 15:20:59	REL-1401/1402/1403	9911506-04D	Sample Duplicate	Z4121313-38
39	12/13/99 15:23:39		CCV	Continuing Calibration Verification	Z4121313-39
40	12/13/99 15:26:21		CCB	Blank, Continuing Calibration	Z4121313-40
41	12/13/99 15:29:01	REL-1151/1152/1153	9911506-05D	Sample	Z4121313-41
42	12/13/99 15:31:42	REL-1151/1152/1153	9911506-05D	Sample Duplicate	Z4121313-42

ANALYSIS BATCH SUMMARY (cont'd)

Analysis Batch # AAZ4 91213133902

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991213133900
Calibration Date 12/13/99

Analysis Start Date/Time 12/13/99 13:39:00
Analysis Stop Date/Time 12/13/99 16:54:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
43	12/13/99 15:34:23	REL-1251/1252/1253	9911506-06D	Sample	Z4121313-43
44	12/13/99 15:37:06	REL-1251/1252/1253	9911506-06D	Sample Duplicate	Z4121313-44
45	12/13/99 15:39:49	REL-1351/1352/1353	9911506-07D	Sample	Z4121313-45
46	12/13/99 15:42:33	REL-1351/1352/1353	9911506-07D	Sample Duplicate	Z4121313-46
47	12/13/99 15:45:16	REL-1451/1452/1453	9911506-08D	Sample	Z4121313-47
48	12/13/99 15:48:00	REL-1451/1452/1453	9911506-08D	Sample Duplicate	Z4121313-48
49	12/13/99 15:50:41	NIST 1633B	9911506-09A	Sample	Z4121313-49
50	12/13/99 15:53:18	NIST 1633B	9911506-09A	Sample Duplicate	Z4121313-50
51	12/13/99 15:55:57		CCV	Continuing Calibration Verification	Z4121313-51
52	12/13/99 15:58:35		CCB	Blank, Continuing Calibration	Z4121313-52

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1101/1102/1103
Lab Sample ID 9911506-01D COMPOS
File # Z4121313-27
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:51:28

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0532	0.00300	.1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1101/1102/1103
Lab Sample ID 9911506-01D COMPOS
File # Z4121313-28
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:54:10

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0520	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1201/1202/1203
Lab Sample ID 9911506-02D COMPOS
File # Z4121313-29
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:56:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.460	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1201/1202/1203
Lab Sample ID 9911506-02D COMPOS
File # Z4121313-30
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:59:36

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.457	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303
Lab Sample ID 9911506-03D COMPOS
File # Z4121313-31
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:02:20

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.205	0.03300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303
Lab Sample ID 9911506-03D COMPOS
File # Z4121313-32
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:05:06

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.204	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303
Lab Sample ID 9911506-03D COMPOS
File # Z4121313-33
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:07:46

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.205	0.00300	.1000

RESULTS

Digestion Batch # GMDG991207083000

Analysis Batch # AA24 91213133902

Project Sample ID REL-1401/1402/1403
Lab Sample ID 9911506-04D COMPOS
File # Z4121313-37
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:18:21

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0140	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1401/1402/1403
Lab Sample ID 9911506-04D COMPOS
File # Z4121313-38
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:20:59

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0165	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1151/1152/1153
Lab Sample ID 9911506-05D COMPOS
File # Z4121313-41
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:29:01

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0228	0.00300	.1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1151/1152/1153
Lab Sample ID 9911506-05D COMPOS
File # Z4121313-42
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:31:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0208	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1251/1252/1253
Lab Sample ID 9911506-06D COMPOS
File # Z4121313-43
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:34:23

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0189	0.00300	-1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1251/1252/1253
Lab Sample ID 9911506-06D COMPOS
File # Z4121313-44
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:37:06

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0207	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1351/1352/1353
Lab Sample ID 9911506-07D COMPOS
File # Z4121313-45
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:39:49

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0300	0.00300	.1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1351/1352/1353
Lab Sample ID 9911506-07D COMPOS
File # Z4121313-46
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:42:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0318	0.00300	-1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1451/1452/1453
Lab Sample ID 9911506-08D COMPOS
File # Z4121313-47
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:45:16

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.00283 J	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1451/1452/1453
Lab Sample ID 9911506-08D COMPOS
File # Z4121313-48
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:48:00

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.00115 J	0.00300	1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID NIST 1633B
Lab Sample ID 9911506-09A
File # Z4121313-49
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:50:41

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Aliquot Mass/Volume 1 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.144	0.00300	-1000

RESULTS

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID NIST 1633B
Lab Sample ID 9911506-09A
File # Z4121313-50
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:53:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.142	0.00300	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GD1G991210100000
Analysis Batch # AAZ4 91213133901

Lab Sample ID CCB
File # Z4121313-23
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 14:40:36

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	0.000129 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991210100000
Analysis Batch # AAZ4 91213133902

Lab Sample ID CCB
File # Z4121313-40
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 15:26:21

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000130 J	0.000030	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GMIG991210100000
Analysis Batch # AAZ4 91213133902

Lab Sample ID CCB
File # Z4121313-52
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 15:58:35

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000123 J	0.000030	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991210100000
Analysis Batch # AAZ4 91213133900

Lab Sample ID ICB
File # Z4121313-9
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 14:03:04

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 — Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000119 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Lab Sample ID BLK993650
File # Z4121313-24
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 14:43:22

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M

Analyte	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Conc. ug	Detection Limit ug	Reporting Limit ug
Mercury	-0.00300 J	0.00300	1000

12/17/99 14:31:19

LABORATORY CONTROL SAMPLE

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Work Order # 9911506

Method Mercury by SW7470A

Test Code HGCSWA00

Date Prepared 12/10/99

Date Analyzed 12/13/99 14:48:44

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As

% Moisture

Aliquot Mass or Vol 50 (mL)

Extract Mass or Vol 50 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995782 File ID Z4121313-25			LCS Duplicate Lab Sample ID LCSD995782 File ID Z4121313-26			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.0100	0.0107	107	0.0100	0.0107	107	82	123	0	13

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91213133901
Initial Calibration # Z4991213133900

Lab Sample ID CCV
File # Z4121313-22
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/13/99 14:37:55

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0100	0.0100	100	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Work Order # 9911506

Analysis Batch # AAZ4 91213133902

Initial Calibration # Z4991213133900

Lab Sample ID CCV

File # Z4121313-39

Method Mercury by SW7470A

Test Code HGCSWA00

Date Analyzed 12/13/99 15:23:39

Reporting Subset ___

Spikes Subset ___

Specs Subset ___

Instrument Z4

Analyst RWG

Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0101	0.0100	101	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91213133902
Initial Calibration # Z4991213133900

Lab Sample ID CCV
File # Z4121313-51
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/13/99 15:55:57

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0101	0.0100	101	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91213133900
Initial Calibration # Z4991213133900

Lab Sample ID ICV
File # Z4121313-8
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/13/99 14:00:22

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00932	0.0100	93	90	110

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1101/1102/1103
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:54:10

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-01D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-01D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0532	0.0520	2.2	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1201/1202/1203
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 14:59:36

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-02D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-02D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.460	0.457	0.61	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303

Method BIF Hg, MW Digested Train

Test Code HGCBMA00

Date Collected 11/16/99

Date Received 11/19/99

Date Prepared 12/10/99

Date Analyzed 12/13/99 15:05:06

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix M

Report As received

	Sample Lab Sample ID 9911506-03D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-03D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.205	0.204	0.46	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:07:46

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-03D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-03D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.205	0.205	0.15	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1401/1402/1403
Method B1F Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:20:59

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-04D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-04D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0140	0.0165	16 Q	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1151/1152/1153
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:31:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-05D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-05D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0228	0.0208	8.8	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1251/1252/1253
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:37:06

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-06D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-06D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0189	0.0207	9.4	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1351/1352/1353
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:42:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-07D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-07D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0300	0.0318	5.8	10

SAMPLE DUPLICATES

Digestion Batch # GMEG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1451/1452/1453
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:48:00

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received

	Sample Lab Sample ID 9911506-08D COMPOS Dil Fact. 1	Duplicate Lab Sample ID 9911506-08D COMPOS Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.00283 J	0.00115 J	84 Q	10

SAMPLE DUPLICATES

Digestion Batch # GMDG991207083000

Analysis Batch # AAZ4 91213133902

Project Sample ID NIST 1633B

Method BIF Hg, MW Digested Train

Test Code HGCBMA00

Date Collected

Date Received 11/19/99

Date Prepared 12/10/99

Date Analyzed 12/13/99 15:53:18

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix M

Report As received

	Sample Lab Sample ID 9911506-09A Dil Fact. 1	Duplicate Lab Sample ID 9911506-09A Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.144	0.142	1.2	10

ANALYTICAL SPIKE(S)

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Project Sample ID REL-1301/1302/1303
Method BIF Hg, MW Digested Train
Test Code HGCBMA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/10/99
Date Analyzed 12/13/99 15:15:41

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix M
Report As received
% Moisture

Spike Sol'n #	Vol. Added	Sample	Spiked Sample	Spiked Sample Dup	Recovery Specification Limits	RPD
		Lab Sample ID 9911506-03D COMPOS	Lab Sample ID 9911506-03D COMPOS	Lab Sample ID 9911506-03D COMPOS		
		File # Z4121313-31	File # Z4121313-35	File # Z4121313-36		
Surrogate Sol'n	Vol. Added	Aliquot Mass/Vol 1 (g)	Aliquot Mass/Vol 1 (g)	Aliquot Mass/Vol 1 (g)		
		Extract Mass/Vol 100 (mL)	Extract Mass/Vol 100 (mL)	Extract Mass/Vol 100 (mL)		
		Dil Fact. 1	Dil Fact. 1.111	Dil Fact. 1.111		

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc. ug	Measured Conc. ug	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	.002	0.205	0.222	0.445	108	0.222	0.442	106	85	115	1.9	20

12/17/99 14:31:19

SERIAL DILUTION CHECK

Digestion Batch # GMDG991207083000
Analysis Batch # AAZ4 91213133902

Work Order # 9911506

Project Sample ID REL-1301/1302/1303
Method B1F Hg, MW Digested Train
Test Code HGCBMA00

Date Prepared 12/10/99
Date Analyzed 12/13/99 15:10:24

Instrument Z4
Analyst RWG
Reviewer MOS

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix M
Report As received

	Sample Result Lab Sample ID 9911506 03D COMPOS Dilution Factor 1		Diluted Sample Result Lab Sample ID 9911506 03D COMPOS Dilution Factor 5		% Difference	
Analyte	Measured Concentration ug	Detection Limit ug	Measured Concentration ug	Detection Limit ug	Result	Specification Limit %
Mercury	0.205	0.00300	0.0724	0.0150	65 Q	10

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Mercury by SW-846 Specification# HGCS

Lab Sample ID / File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

QUALITY CONTROL EXCEPTION REPORT
SUMMARY

QCER #	Analysis Batch Number
991213-01	Z4991213133902

QUALITY CONTROL EXCEPTION REPORT
LEVEL 2 - ANALYTICAL

REPORT COPY 9911506

QCER # 991213-01

Revised: 12/14/99

Analyst: RWG
Batch #: Z4991213133902
Prot Spec: 3.018
Instrument: Z4
Matrix: MICROWAVE
Analysis File #: _____
Date Analyzed: 12/13/99
Status: C
Analyte: HG

Lab Sample ID:	Client ID:	CSC:	Project Sample ID:
9911506	RELIANT_HG	DPM	

SAMPLE PREPARATION:

PROBLEM IDENTIFICATION

- Sample Went Dry _
- Loss of ____ % of Sample _
- Emulsion Formed _
- Blank Contamination _
- Instrument _
- Hold Time _
- MS/MSD Not Available _
- Instrument _
- Other (Describe) _

CORRECTIVE ACTION TAKEN

- Reprepare Sample _
- Sample Sent for Analysis _
- Resample _
- Other (Describe) _

Comments: _____

SAMPLE ANALYSIS:

PROBLEM IDENTIFICATION

- Surrogate Recovery _
- MS/MSD Recovery _
- LCS/LCSD Recovery _
- MS/MSD Precision _
- LCS/LCSD Precision _
- Standard _
- Blank Contamination _
- Instrument _
- Hold Time _
- No MS/MSD Available for Batch _
- Sample pH _
- Dil. Due to Hi-Level Non-Target Analytes _
- Serial Dilution _
- Analytical Spike _
- Internal Standard _
- Other (Describe) X
  sample dup out

PROBABLE CAUSE

- Matrix Effect _
- Instrument _
- Spiking Error _
- Contamination _
- Coelution _
- Unknown _
- Other(Describe) X
  LOW LEVEL

CORRECTIVE ACTION TAKEN

- Reprepare Sample _
- Reanalyze Sample _
- Reanalyze LCS/LCSD _
- Recalibrate Instrument _
- Analyze Out of Hold Time _
- Prepare New Standard _
- Flag Data X
- Resample _
- Analyze by MSA _
- Perform Analytical Spike _
- No Action Required _
- Level 3 QCER to Follow _
- Other (Describe) _

Comments: 9911506-04D was outside RPD tolerance at 16%. The sample concentration was less than 5X the DL for the instrument. It is difficult to resolve values in this range to a high precision. Sample -8D was also outside of RPD tolerances at 85%. This sample

was below the detection limit. As the analyte level goes toward zero it becomes increasingly difficult to resolve such values within the method's precision tolerances.

12/10/99 15:30:39

RADIAN ANALYTICAL SERVICES
FPAS REPORT
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Work Order # 9911507

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG

Certified By [signature]
Date 12/10/99

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12/10/99 15:30:39

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911507
Page 1

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-1104	01A	HGCBTA00	Mercury by CVAAS
REL-1204	02A	HGCBTA00	Mercury by CVAAS
REL-1304	03A	HGCBTA00	Mercury by CVAAS
REL-1404	04A	HGCBTA00	Mercury by CVAAS
REL-1154	05A	HGCBTA00	Mercury by CVAAS
REL-1254	06A	HGCBTA00	Mercury by CVAAS
REL-1354	07A	HGCBTA00	Mercury by CVAAS
REL-1454	08A	HGCBTA00	Mercury by CVAAS
REL-1404	09A MS	HGCBTA00	Mercury by CVAAS
	10A MSD	HGCBTA00	Mercury by CVAAS

WORK ORDER COMMENTS

Post digestion spikes not performed on all GFAAS analyses per Item 271 of the New York ELAP manual. Post digestion spikes were performed, as necessary, when recoveries for serial dilutions or matrix spikes for an analytical batch did not fall within recovery tolerances.

Total Sample Volumes (mL)

01A - 785
02A - 880
03A - 998
04A - 593
05A - 940
06A - 690
07A - 835
08A - 650

STATE CERTIFICATIONS

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG
Method Mercury by SW-846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
REL-1104	9911507-01A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1104	9911507-01A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1154	9911507-05A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1154	9911507-05A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1204	9911507-02A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1204	9911507-02A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1254	9911507-06A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1254	9911507-06A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1304	9911507-03A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1304	9911507-03A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1304	9911507-03A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1354	9911507-07A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1354	9911507-07A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1404	9911507-04A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1404	9911507-04A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1404	9911507-04A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1404	9911507-04A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1454	9911507-08A	HGCBTA00	GDIG991207101000	AAZ4__91208101301
REL-1454	9911507-08A	HGCBTA00	GDIG991207101000	AAZ4__91208101301

RESULTS SUMMARY

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1104		REL-1104		REL-1154		REL-1154	
Lab ID:	9911507-01A		9911507-01A		9911507-05A		9911507-05A	
File ID:	Z4120810-38		Z4120810-39		Z4120810-28		Z4120810-29	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 12:15:42		12/08/99 12:18:25		12/08/99 11:31:36		12/08/99 11:34:18	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	3.75	0.118	3.74	0.118	34.8	0.141	36.3	0.141

Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Project Sample ID:	REL-1204		REL-1204		REL-1254		REL-1254	
Lab ID:	9911507-02A		9911507-02A		9911507-06A		9911507-06A	
File ID:	Z4120810-40		Z4120810-41		Z4120810-30		Z4120810-31	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 12:21:10		12/08/99 12:23:55		12/08/99 11:37:01		12/08/99 11:39:44	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	4.44	0.132	4.44	0.132	37.8	0.104	36.6	0.104

RESULTS SUMMARY (Cont'd)

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1304		REL-1304		REL-1304		REL-1354	
Lab ID:	9911507-03A		9911507-03A		9911507-03A		9911507-07A	
File ID:	Z4120810-18		Z4120810-19		Z4120810-20		Z4120810-32	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 11:05:02		12/08/99 11:07:38		12/08/99 11:10:17		12/08/99 11:42:28	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	2.00	0.150	2.08	0.150	2.00	0.150	39.5	0.125

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1354		REL-1404		REL-1404		REL-1404	
Lab ID:	9911507-07A		9911507-04A		9911507-04A		9911507-04A	
File ID:	Z4120810-33		Z4120810-26		Z4120810-27		Z4120810-42	
Date Collected:	11/16/99		11/17/99		11/17/99		11/17/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 11:45:08		12/08/99 11:26:12		12/08/99 11:28:53		12/08/99 12:28:38	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	39.7	0.125	-0.0534 RJ	0.0890	0.136 RJ	0.0890	0.0258 J	0.0890

Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Project Sample ID:	REL-1404		REL-1454		REL-1454			
Lab ID:	9911507-04A		9911507-08A		9911507-08A			
File ID:	Z4120810-43		Z4120810-34		Z4120810-35			
Date Collected:	11/17/99		11/17/99		11/17/99			
Date Prepared:	12/07/99		12/07/99		12/07/99			
Date Analyzed:	12/08/99 12:31:18		12/08/99 11:47:44		12/08/99 11:50:21			
Dilution Factor:	5		5		5			
Matrix:	Train-Back		Train-Back		Train-Back			
Units:	ug		ug		ug			
Report as:	received		received		received			
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.0231 J	0.0890	1.68	0.0975	1.78	0.0975		

12/10/99 15:30:39

INITIAL CALIBRATION

Work Order # 9911507

Initial Calibration # Z4991208101300

Calibration Date 12/08/99 10:13:00

Sol'n #

Method Mercury by SW-846

Test Code HGCSWA00

Instrument Z4

Analyst RWG

Reviewer MOS

Analytes	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Correlation Coefficient
Mercury	0.000 0	0.0037996 0.0005	0.0083683 0.001	0.0165207 0.002	0.0326568 0.004	0.0814841 0.010	0.1605170 0.020	1.000

Specification Limits for correlation coefficient >0.995

DIGESTION BATCH SUMMARY

Digestion Batch # GDIG991207101000

Method Digestion by SW7470A
Test Code DHGSWA00

Extraction Start Date/Time 12/07/99 10:10:00
Extraction Stop Date/Time

Analyst RWG
Reviewer PRS

Sample	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
1	REL-1104	9911507-01A	10	
2	REL-1204	9911507-02A	10	
3	REL-1304	9911507-03A	10	
4	REL-1404	9911507-04A	10	
5	REL-1154	9911507-05A	10	
6	REL-1254	9911507-06A	10	
7	REL-1354	9911507-07A	10	
8	REL-1454	9911507-08A	10	
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Quality Control	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
Blank		BLK993641	10	
Detectability Check Sample		DCS995768	50	
Laboratory Control Sample		LCS996769	50	
Laboratory Control Sample Duplicate		LCSD996769	50	
Matrix Spike	REL-1404	9911507-09A	10	
Matrix Spike Duplicate	REL-1404	9911507-10A	10	

ANALYSIS BATCH SUMMARY

Analysis Batch # AAZ4 91208101301

Work Order # 9911507

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991208101300
Calibration Date 12/08/99

Analysis Start Date/Time 12/08/99 10:13:00
Analysis Stop Date/Time 12/08/99 12:36:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1	12/08/99 10:17:14		S_0	Initial Calibration Blank	Z4120810-1
2	12/08/99 10:19:54		S_05	Initial Calibration Standard 1	Z4120810-2
3	12/08/99 10:22:34		S_1	Initial Calibration Standard 2	Z4120810-3
4	12/08/99 10:25:14		S_2	Initial Calibration Standard 3	Z4120810-4
5	12/08/99 10:27:56		S_4	Initial Calibration Standard 4	Z4120810-5
6	12/08/99 10:30:39		S_10	Initial Calibration Standard 5	Z4120810-6
7	12/08/99 10:33:23		S_20	Initial Calibration Standard 6	Z4120810-7
8	12/08/99 10:38:14		ICV	Initial Calibration Verification	Z4120810-8
9	12/08/99 10:40:55		ICB	Blank, Initial Calibration	Z4120810-9
10	12/08/99 10:43:33		BLK993641	Blank, Method	Z4120810-10
11	12/08/99 10:46:10		DCS995768	Detectability Check Sample	Z4120810-11
12	12/08/99 10:48:50		LCS995769	Lab Control Sample	Z4120810-12
13	12/08/99 10:51:30		LCSD995769	Lab Control Sample Duplicate	Z4120810-13
14	12/08/99 10:54:11	REL-1104	9911507-01A	Sample	Z4120810-14
15	12/08/99 10:56:54	REL-1104	9911507-01A	Sample Duplicate	Z4120810-15
16	12/08/99 10:59:37	REL-1204	9911507-02A	Sample	Z4120810-16
17	12/08/99 11:02:21	REL-1204	9911507-02A	Sample Duplicate	Z4120810-17
18	12/08/99 11:05:02	REL-1304	9911507-03A	Sample	Z4120810-18
19	12/08/99 11:07:38	REL-1304	9911507-03A	Sample Duplicate	Z4120810-19
20	12/08/99 11:10:17	REL-1304	9911507-03A	Sample Duplicate	Z4120810-20
21	12/08/99 11:12:55	REL-1304	9911507-03A	Analytical Spike	Z4120810-21
22	12/08/99 11:15:33	REL-1404	9911507-09A	Matrix Spike	Z4120810-22
23	12/08/99 11:18:12	REL-1404	9911507-10A	Matrix Spike Duplicate	Z4120810-23
24	12/08/99 11:20:52		CCV	Continuing Calibration Verification	Z4120810-24
25	12/08/99 11:23:32		CCB	Blank, Continuing Calibration	Z4120810-25
26	12/08/99 11:26:12	REL-1404	9911507-04A	Sample	Z4120810-26
27	12/08/99 11:28:53	REL-1404	9911507-04A	Sample Duplicate	Z4120810-27
28	12/08/99 11:31:36	REL-1154	9911507-05A	Sample	Z4120810-28
29	12/08/99 11:34:18	REL-1154	9911507-05A	Sample Duplicate	Z4120810-29
30	12/08/99 11:37:01	REL-1254	9911507-06A	Sample	Z4120810-30

ANALYSIS BATCH SUMMARY (cont'd)

Analysis Batch # AAZ4 91208101301

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991208101300
Calibration Date 12/08/99

Analysis Start Date/Time 12/08/99 10:13:00
Analysis Stop Date/Time 12/08/99 12:36:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
31	12/08/99 11:39:44	REL-1254	9911507-06A	Sample Duplicate	Z4120810-31
32	12/08/99 11:42:28	REL-1354	9911507-07A	Sample	Z4120810-32
33	12/08/99 11:45:08	REL-1354	9911507-07A	Sample Duplicate	Z4120810-33
34	12/08/99 11:47:44	REL-1454	9911507-08A	Sample	Z4120810-34
35	12/08/99 11:50:21	REL-1454	9911507-08A	Sample Duplicate	Z4120810-35
36	12/08/99 11:53:02		CCV	Continuing Calibration Verification	Z4120810-36
37	12/08/99 11:55:43		CCB	Blank, Continuing Calibration	Z4120810-37
38	12/08/99 12:15:42	REL-1104	9911507-01A	Sample	Z4120810-38
39	12/08/99 12:18:25	REL-1104	9911507-01A	Sample Duplicate	Z4120810-39
40	12/08/99 12:21:10	REL-1204	9911507-02A	Sample	Z4120810-40
41	12/08/99 12:23:55	REL-1204	9911507-02A	Sample Duplicate	Z4120810-41
42	12/08/99 12:28:38	REL-1404	9911507-04A	Sample	Z4120810-42
43	12/08/99 12:31:18	REL-1404	9911507-04A	Sample Duplicate	Z4120810-43
44	12/08/99 12:34:01		CCV	Continuing Calibration Verification	Z4120810-44
45	12/08/99 12:36:43		CCB	Blank, Continuing Calibration	Z4120810-45

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1304
Lab Sample ID 9911507-03A
File # Z4120810-18
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:05:02

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 998 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	2.00	0.150	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1304
Lab Sample ID 9911507-03A
File # Z4120810-19
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:07:38

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 998 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	2.08	0.150	-1000

R E S U L T S

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1304
Lab Sample ID 9911507-03A
File # Z4120810-20
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:10:17

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 10 (g) Extract/Digestate Volume 998 (mL) Dilution Factor 5 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	2.00	0.150	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404
Lab Sample ID 9911507-04A
File # Z4120810-26
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:26:12

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 593 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	-0.0534 RJ	0.0890	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404
Lab Sample ID 9911507-04A
File # Z4120810-27
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:28:53

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 593 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	-0.136 RJ	0.0890	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1154
Lab Sample ID 9911507-05A
File # Z4120810-28
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:31:36

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 940 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	34.8	0.141	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1154
Lab Sample ID 9911507-05A
File # Z4120810-29
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:34:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 940 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	36.3	0.141	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1254
Lab Sample ID 9911507-06A
File # Z4120810-30
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:37:01

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 690 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	37.8	0.104	-1000

RESULTS

Work Order # 9911507

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1254
Lab Sample ID 9911507-06A
File # Z4120810-31
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:39:44

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 690 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	36.6	0.104	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1354
Lab Sample ID 9911507-07A
File # Z4120810-32
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:42:28

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 835 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	39.5	0.125	1000

RESULTS

Work Order # 9911507

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1354
Lab Sample ID 9911507-07A
File # Z4120810-33
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:45:08

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 835 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	39.7	0.125	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1454
Lab Sample ID 9911507-08A
File # Z4120810-34
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:47:44

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 650 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.68	0.0975	1000

RESULTS

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1454
Lab Sample ID 9911507-08A
File # Z4120810-35
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:50:21

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 650 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.78	0.0975	1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1104
Lab Sample ID 9911507-01A
File # Z4120810-38
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:15:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 785 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	3.75	0.118	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1104
Lab Sample ID 9911507-01A
File # Z4120810.39
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:18:25

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 785 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	3.74	0.118	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1204
Lab Sample ID 9911507-02A
File # Z4120810-40
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:21:10

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 880 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	4.44	0.132	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1204
Lab Sample ID 9911507-02A
File # Z4120810-41
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:23:55

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 880 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	4.44	0.132	-1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404
Lab Sample ID 9911507-04A
File # Z4120810-42
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:28:38

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 593 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0258 J	0.0890	.1000

RESULTS

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404
Lab Sample ID 9911507-04A
File # Z4120810-43
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:31:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 593 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0231 J	0.0890	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100500
Analysis Batch # AAZ4 91208101301

Lab Sample ID CCB
File # Z4120810-25
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 11:23:32

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000030 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100500
Analysis Batch # AAZ4 91208101301

Lab Sample ID CCB
File # Z4120810-37
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 11:55:43

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000029 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100500
Analysis Batch # AAZ4 91208101301

Lab Sample ID CCB
File # Z4120810-45
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 12:36:43

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000029 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100500
Analysis Batch # AAZ4 91208101301

Lab Sample ID ICB
File # Z4120810-9
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 10:40:55

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000028 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Lab Sample ID BLK993641
File # Z4120810-10
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 10:43:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T

Analyte	Aliquot Mass/Volume 10 (g) Extract/Digestate Volume 900 (mL) Dilution Factor 5 Measured Conc. ug	Detection Limit ug	Reporting Limit ug
Mercury	-0.158 J	0.135	-1000

12/10/99 15:30:39

LABORATORY CONTROL SAMPLE

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Work Order # 9911507

Method Mercury by SW7470A

Test Code HGCSWA00

Date Prepared 12/07/99

Date Analyzed 12/08/99 10:51:30

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As

% Moisture

Aliquot Mass or Vol 50 (mL)

Extract Mass or Vol 50 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995769 File ID Z4120810-12			LCS Duplicate Lab Sample ID LCSD995769 File ID Z4120810-13			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.0100	0.00990	99	0.0100	0.0102	102	82	123	3.0	13

MATRIX SPIKE(S)

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Work Order # 9911507

Project Sample ID REL-1404
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:18:12

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Spike Sol'n #	Vol. Added	Sample	Spiked Sample	Spiked Sample Dup	Recovery Specification Limits	RPD
		Lab Sample ID 9911507-03A	Lab Sample ID 9911507-09A MS	Lab Sample ID 9911507-10A MSD		
Surrogate Sol'n	Vol. Added	File # Z4120810-18	File # Z4120810-22	File # Z4120810-23		
		Aliquot Mass/Vol 10 (g)	Aliquot Mass/Vol 10 (g)	Aliquot Mass/Vol 10 (g)		
		Extract Mass/Vol 998 (mL)	Extract Mass/Vol 998 (mL)	Extract Mass/Vol 998 (mL)		
		Dil Fact. 5	Dil Fact. 5	Dil Fact. 5		

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc ug	Measured Conc. ug	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	0.002	2.00	9.98	10.8	88	9.98	11.1	91	70	130	3.4	25

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208101301
Initial Calibration # Z4991208101300

Lab Sample ID CCV
Date Analyzed 12/08/99 11:20:52
Reporting Subset ___
Instrument Z4
File # Z4120810-24
Spikes Subset ___
Analyst RWG
Method Mercury by SW7470A
Specs Subset ___
Reviewer MOS
Test Code HGCSWA00

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0103	0.0100	103	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208101301
Initial Calibration # Z4991208101300

Lab Sample ID CCV
File # Z4120810-36
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 11:53:02

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0106	0.0100	106	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208101301

Initial Calibration # Z4991208101300

Lab Sample ID CCV
Date Analyzed 12/08/99 12:34:01
Reporting Subset ___
Instrument Z4
File # Z4120810-44
Spikes Subset ___
Analyst RWG
Method Mercury by SW7470A
Specs Subset ___
Reviewer MOS
Test Code HGCSWA00

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0105	0.0100	105	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208101301
Initial Calibration # Z4991208101300

Lab Sample ID 1CV
File # Z4120810-8
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 10:38:14

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0100	0.0100	100	90	110

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1304
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:07:38

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-03A Dil Fact. 5	Duplicate Lab Sample ID 9911507-03A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	2.00	2.08	3.8	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1304
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:10:17

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-03A Dil Fact. 5	Duplicate Lab Sample ID 9911507-03A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	2.00	2.00	0.28	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Date Collected 11/17/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/08/99 11:28:53

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix T

Report As received

	Sample Lab Sample ID 9911507-04A Dil Fact. 5	Duplicate Lab Sample ID 9911507-04A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	-0.0534 RJ	-0.136 RJ	88 Q	20

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1154
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 11:34:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-05A Dil Fact. 5	Duplicate Lab Sample ID 9911507-05A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	34.8	36.3	4.3	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1104
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:18:25

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-01A Dil Fact. 5	Duplicate Lab Sample ID 9911507-01A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	3.75	3.74	0.47	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1204
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:23:55

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-02A Dil Fact. 5	Duplicate Lab Sample ID 9911507-02A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	4.44	4.44	0.14	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207101000
Analysis Batch # AAZ4 91208101301

Project Sample ID REL-1404
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 12:31:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911507-04A Dil Fact. 5	Duplicate Lab Sample ID 9911507-04A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0258 J	0.0231 J	11 Q	10

12/10/99 15:30:39

ANALYTICAL SPIKE(S)

Digestion Batch # GDIG991207101000

Analysis Batch # AAZ4 91208101301

Work Order # 9911507

Project Sample ID REL-1304

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Date Collected 11/16/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/08/99 11:12:55

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix T

Report As received

% Moisture

Spike Sol'n #	Vol. Added	Sample	Spiked Sample	Spiked Sample Dup	Recovery Specification Limits	RPD
		Lab Sample ID 9911507-03A	Lab Sample ID 9911507-03A	Lab Sample ID		
		File # Z4120810-18	File # Z4120810-21	File #		
Surrogate Sol'n	Vol. Added	Aliquot Mass/Vol 10 (g)	Aliquot Mass/Vol 10 (g)	Aliquot Mass/Vol		
		Extract Mass/Vol 998 (mL)	Extract Mass/Vol 998 (mL)	Extract Mass/Vol		
		Dil Fact. 5	Dil Fact. 5.555	Dil Fact.		

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc.	Measured Conc.	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	.002	2.00	11.1	13.1	100				85	115		

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Mercury by SW-846 Specification# HGCS

Lab Sample ID File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

QUALITY CONTROL EXCEPTION REPORT
SUMMARY

QCER #	Analysis Batch Number
991208-03	Z4991208101300

QUALITY CONTROL EXCEPTION REPORT
LEVEL 2 - ANALYTICAL

REPORT COPY 9911507

QCER # 991208-03

Revised: 12/10/99

Analyst: RWG Instrument: Z4 Date Analyzed: 12/08/99
Batch #: Z4991208101300 Matrix: KCl impin Status: C
Prot Spec: 3.018 Analysis File #: _____ Analyte: HG

Lab Sample ID:	Client ID:	CSC:	Project Sample ID:
9911507	RELIANT_HG	DPM	

SAMPLE PREPARATION:

PROBLEM IDENTIFICATION
- Sample Went Dry _
- Loss of ____ % of Sample _
- Emulsion Formed _
- Blank Contamination _
- Instrument _
- Hold Time _
- MS/MSD Not Available _
- Instrument _
- Other (Describe) _

CORRECTIVE ACTION TAKEN
- Reprepare Sample _
- Sample Sent for Analysis _
- Resample _
- Other (Describe) _

Comments: _____

SAMPLE ANALYSIS:

PROBLEM IDENTIFICATION
- Surrogate Recovery _
- MS/MSD Recovery _
- LCS/LCSD Recovery _
- MS/MSD Precision _
- LCS/LCSD Precision _
- Standard _
- Blank Contamination _
- Instrument _
- Hold Time _
- No MS/MSD Available for Batch _
- Sample pH _
- Dil. Due to Hi-Level Non-Target Analytes _
- Serial Dilution _
- Analytical Spike _
- Internal Standard _
- Other (Describe) X
  Sample dupe RPD out

PROBABLE CAUSE
- Matrix Effect _
- Instrument _
- Spiking Error _
- Contamination _
- Coelution _
- Unknown _
- Other(Describe) X
  LOW LEVEL

CORRECTIVE ACTION TAKEN
- Reprepare Sample _
- Reanalyze Sample _
- Reanalyze LCS/LCSD _
- Recalibrate Instrument _
- Analyze Out of Hold Time _
- Prepare New Standard _
- Flag Data X
- Resample _
- Analyze by MSA _
- Perform Analytical Spike _
- No Action Required _
- Level 3 QCER to Follow _
- Other (Describe) _

Comments: RPD for sample -04A was outside the 10% tolerance at 88%. The samples had negative values for mercury. Samples with Hg values below the detection limit are expected to have high RPD values. The samples were reran and were outside tolerance

at 11%.

RADIAN ANALYTICAL SERVICES

FPAS REPORT

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Work Order # 9911511

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG

Certified By Morgan Rose
Date 12/10/99

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12/10/99 15:29:21

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911511
Page 1

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-1105	01A	HGCBTA00	Mercury by CVAAS
REL-1205	03A	HGCBTA00	Mercury by CVAAS
REL-1305	05A	HGCBTA00	Mercury by CVAAS
REL-1405	07A	HGCBTA00	Mercury by CVAAS
REL-1155	09A	HGCBTA00	Mercury by CVAAS
REL-1255	11A	HGCBTA00	Mercury by CVAAS
REL-1355	13A	HGCBTA00	Mercury by CVAAS
REL-1455	15A	HGCBTA00	Mercury by CVAAS
REL-1205	17A MS	HGCBTA00	Mercury by CVAAS
	18A MSD	HGCBTA00	Mercury by CVAAS

WORK ORDER COMMENTS

Post digestion spikes not performed on all GFAAS analyses per Item 271 of the New York ELAP manual. Post digestion spikes were performed, as necessary, when recoveries for serial dilutions or matrix spikes for an analytical batch did not fall within recovery tolerances.

Total Sample Volumes (mL)

01A - 185
03A - 118
05A - 155
07A - 145
09A - 175
11A - 155
13A - 175
15A - 155

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Work Order # 9911511

Client RELIANT ENERGY

Facility HL&P LIMESTONE STATION

Client Code RELIANT HG

Method Mercury by SW-846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
REL-1105	9911511-01A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1105	9911511-01A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1155	9911511-09A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1155	9911511-09A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1205	9911511-03A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1205	9911511-03A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1205	9911511-03A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1255	9911511-11A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1255	9911511-11A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1305	9911511-05A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1305	9911511-05A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1355	9911511-13A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1355	9911511-13A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1405	9911511-07A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1405	9911511-07A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1455	9911511-15A	HGCBTA00	GDIG991207105000	AAZ4__91209090002
REL-1455	9911511-15A	HGCBTA00	GDIG991207105000	AAZ4__91209090002

RESULTS SUMMARY

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1105		REL-1105		REL-1155		REL 1155	
Lab ID:	9911511-01A		9911511-01A		9911511-09A		9911511-09A	
File ID:	Z4120909-44		Z4120909-45		Z4120909-56		Z4120909-57	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/09/99 10:55:52		12/09/99 10:58:34		12/09/99 11:27:53		12/09/99 11:30:33	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.236	0.0278	0.214	0.0278	0.948	0.0262	0.931	0.0262

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1205		REL-1205		REL-1205		REL-1255	
Lab ID:	9911511-03A		9911511-03A		9911511-03A		9911511-11A	
File ID:	Z4120909-46		Z4120909-47		Z4120909-48		Z4120909-60	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/09/99 11:01:17		12/09/99 11:03:59		12/09/99 11:06:42		12/09/99 11:38:34	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.637	0.0177	0.652	0.0177	0.648	0.0177	1.25	0.0232

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1255		REL-1305		REL-1305		REL-1355	
Lab ID:	9911511-11A		9911511-05A		9911511-05A		9911511-13A	
File ID:	Z4120909-61		Z4120909-52		Z4120909-53		Z4120909-62	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/09/99 11:41:16		12/09/99 11:17:20		12/09/99 11:19:58		12/09/99 11:43:57	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	1.26	0.0232	0.359	0.0232	0.354	0.0232	1.45	0.0262

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1355		REL-1405		REL-1405		REL-1455	
Lab ID:	9911511-13A		9911511-07A		9911511-07A		9911511-15A	
File ID:	Z4120909-63		Z4120909-54		Z4120909-55		Z4120909-64	
Date Collected:	11/16/99		11/17/99		11/17/99		11/17/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/09/99 11:46:40		12/09/99 11:22:37		12/09/99 11:25:15		12/09/99 11:49:22	
Dilution Factor:	5		5		5		5	
Matrix:	Train-Back		Train-Back		Train-Back		Train-Back	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	1.47	0.0262	0.0548	0.0218	0.0554	0.0218	0.0817	0.0232

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Project Sample ID:	REL-1455							
Lab ID:	9911511-15A							
File ID:	Z4120909-65							
Date Collected:	11/17/99							
Date Prepared:	12/07/99							
Date Analyzed:	12/09/99 11:52:01							
Dilution Factor:	5							
Matrix:	Train-Back							
Units:	ug							
Report as:	received							
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.0942	0.0232						

12/10/99 15:29:21

INITIAL CALIBRATION

Work Order # 9911511

Initial Calibration # Z4991209090000

Calibration Date 12/09/99 09:00:00

Sol'n #

Method Mercury by SW-846

Test Code HGCSWA00

Instrument Z4

Analyst RWG

Reviewer MOS

Analytes	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Correlation Coefficient
Mercury	0.000 0	0.0036248 0.0005	0.0081854 0.001	0.0167060 0.002	0.0331199 0.004	0.0817921 0.010	0.1643181 0.020	1.000

Specification Limits for correlation coefficient >0.995

DIGESTION BATCH SUMMARY

Digestion Batch # GDIG991207105000

Method Digestion by SW7470A
Test Code DHGSWA00

Extraction Start Date/Time 12/07/99 10:50:00
Extraction Stop Date/Time

Analyst RWG
Reviewer PRS

Sample	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
1		9911545-01A	10	
2		9911545-02A	10	
3		9911545-03A	10	
4		9911545-04A	10	
5		9911545-05A	10	
6		9911545-06A	10	
7		9911545-07A	10	
8		9911545-09A	10	
9	REL-1105	9911511-01A	10	
10	REL-1205	9911511-03A	10	
11	REL-1305	9911511-05A	10	
12	REL-1405	9911511-07A	10	
13	REL-1155	9911511-09A	10	
14	REL-1255	9911511-11A	10	
15	REL-1355	9911511-13A	10	
16	REL-1455	9911511-15A	10	
17				
18				
19				
20				

Quality Control	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
Blank		BLK993646	10	
Detectability Check Sample		DCS995776	50	
Laboratory Control Sample		LCS995777	50	
Laboratory Control Sample Duplicate		LCSD995777	50	
Matrix Spike	REL-1205	9911511-17A	10	
Matrix Spike Duplicate	REL-1205	9911511-18A	10	

ANALYSIS BATCH SUMMARY

Analysis Batch # AAZ4 91209090002

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991209090000
Calibration Date 12/09/99

Analysis Start Date/Time 12/09/99 09:00:00
Analysis Stop Date/Time 12/09/99 11:57:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
2	12/09/99 09:01:40		S_0	Initial Calibration Blank	Z4120909-2
3	12/09/99 09:04:20		S_05	Initial Calibration Standard 1	Z4120909-3
4	12/09/99 09:06:59		S_1	Initial Calibration Standard 2	Z4120909-4
5	12/09/99 09:09:40		S_2	Initial Calibration Standard 3	Z4120909-5
6	12/09/99 09:12:21		S_4	Initial Calibration Standard 4	Z4120909-6
7	12/09/99 09:15:04		S_10	Initial Calibration Standard 5	Z4120909-7
8	12/09/99 09:17:48		S_20	Initial Calibration Standard 6	Z4120909-8
9	12/09/99 09:22:13		ICV	Initial Calibration Verification	Z4120909-9
10	12/09/99 09:24:55		ICB	Blank, Initial Calibration	Z4120909-10
28	12/09/99 10:13:05		CCV	Continuing Calibration Verification	Z4120909-28
29	12/09/99 10:15:48		CCB	Blank, Continuing Calibration	Z4120909-29
30	12/09/99 10:18:30		BLK993646	Blank, Method	Z4120909-30
31	12/09/99 10:21:13		DCS995776	Detectability Check Sample	Z4120909-31
32	12/09/99 10:23:57		LCS995777	Lab Control Sample	Z4120909-32
33	12/09/99 10:26:42		LCS995777	Lab Control Sample Duplicate	Z4120909-33
34	12/09/99 10:29:22		9911545-01A	Sample	Z4120909-34
35	12/09/99 10:31:58		9911545-02A	Sample	Z4120909-35
36	12/09/99 10:34:36		9911545-03A	Sample	Z4120909-36
37	12/09/99 10:37:14		9911545-04A	Sample	Z4120909-37
38	12/09/99 10:39:52		9911545-05A	Sample	Z4120909-38
39	12/09/99 10:42:30		9911545-06A	Sample	Z4120909-39
40	12/09/99 10:45:09		9911545-07A	Sample	Z4120909-40
41	12/09/99 10:47:50		9911545-09A	Sample	Z4120909-41
42	12/09/99 10:50:30		CCV	Continuing Calibration Verification	Z4120909-42
43	12/09/99 10:53:10		CCB	Blank, Continuing Calibration	Z4120909-43
44	12/09/99 10:55:52	REL-1105	9911511-01A	Sample	Z4120909-44
45	12/09/99 10:58:34	REL-1105	9911511-01A	Sample Duplicate	Z4120909-45
46	12/09/99 11:01:17	REL-1205	9911511-03A	Sample	Z4120909-46
47	12/09/99 11:03:59	REL-1205	9911511-03A	Sample Duplicate	Z4120909-47
48	12/09/99 11:06:42	REL-1205	9911511-03A	Sample Duplicate	Z4120909-48

ANALYSIS BATCH SUMMARY (cont'd)

Analysis Batch # AAZ4 91209090002

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991209090000
Calibration Date 12/09/99

Analysis Start Date/Time 12/09/99 09:00:00
Analysis Stop Date/Time 12/09/99 11:57:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
49	12/09/99 11:09:25	REL-1205	9911511-03A	Analytical Spike	Z4120909-49
50	12/09/99 11:12:05	REL-1205	9911511-17A	Matrix Spike	Z4120909-50
51	12/09/99 11:14:43	REL-1205	9911511-18A	Matrix Spike Duplicate	Z4120909-51
52	12/09/99 11:17:20	REL-1305	9911511-05A	Sample	Z4120909-52
53	12/09/99 11:19:58	REL-1305	9911511-05A	Sample Duplicate	Z4120909-53
54	12/09/99 11:22:37	REL-1405	9911511-07A	Sample	Z4120909-54
55	12/09/99 11:25:15	REL-1405	9911511-07A	Sample Duplicate	Z4120909-55
56	12/09/99 11:27:53	REL-1155	9911511-09A	Sample	Z4120909-56
57	12/09/99 11:30:33	REL-1155	9911511-09A	Sample Duplicate	Z4120909-57
58	12/09/99 11:33:13		CCV	Continuing Calibration Verification	Z4120909-58
59	12/09/99 11:35:54		CCB	Blank, Continuing Calibration	Z4120909-59
60	12/09/99 11:38:34	REL-1255	9911511-11A	Sample	Z4120909-60
61	12/09/99 11:41:16	REL-1255	9911511-11A	Sample Duplicate	Z4120909-61
62	12/09/99 11:43:57	REL-1355	9911511-13A	Sample	Z4120909-62
63	12/09/99 11:46:40	REL-1355	9911511-13A	Sample Duplicate	Z4120909-63
64	12/09/99 11:49:22	REL-1455	9911511-15A	Sample	Z4120909-64
65	12/09/99 11:52:01	REL-1455	9911511-15A	Sample Duplicate	Z4120909-65
66	12/09/99 11:54:42		CCV	Continuing Calibration Verification	Z4120909-66
67	12/09/99 11:57:23		CCB	Blank, Continuing Calibration	Z4120909-67

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1105
Lab Sample ID 9911511-01A
File # Z4120909-44
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 10:55:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 185 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.236	0.0278	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1105
Lab Sample ID 9911511-01A
File # Z4120909-45
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 10:58:34

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 185 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.214	0.0278	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205
Lab Sample ID 9911511-03A
File # Z4120909-46
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:01:17

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 118 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.637	0.0177	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205
Lab Sample ID 9911511-03A
File # Z4120909-47
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:03:59

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 118 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.652	0.0177	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205
Lab Sample ID 9911511-03A
File # Z4120909-48
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:06:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 118 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.648	0.0177	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1305
Lab Sample ID 9911511-05A
File # Z4120909-52
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:17:20

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.359	0.0232	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1305
Lab Sample ID 9911511-05A
File # Z4120909-53
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:19:58

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.354	0.0232	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1405
Lab Sample ID 9911511-07A
File # Z4120909-54
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:22:37

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 145 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0548	0.0218	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1405
Lab Sample ID 9911511-07A
File # Z4120909-55
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:25:15

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 145 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0554	0.0218	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1155
Lab Sample ID 9911511-09A
File # Z4120909-56
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:27:53

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 175 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.948	0.0262	1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1155
Lab Sample ID 9911511-09A
File # Z4120909-57
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:30:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 175 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.931	0.0262	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1255
Lab Sample ID 9911511-11A
File # Z4120909-60
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:38:34

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.25	0.0232	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1255
Lab Sample ID 9911511-11A
File # Z4120909-61
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:41:16

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.26	0.0232	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1355
Lab Sample ID 9911511-13A
File # Z4120909-62
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:43:57

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 10 (g) Extract/Digestate Volume 175 (mL) Dilution Factor 5 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.45	0.0262	.1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1355
Lab Sample ID 9911511-13A
File # Z4120909-63
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:46:40

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 175 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	1.47	0.0262	-1000

RESULTS

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1455
Lab Sample ID 9911511-15A
File # Z4120909-64
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:49:22

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0817	0.0232	-1000

RESULTS

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1455
Lab Sample ID 9911511-15A
File # Z4120909-65
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:52:01

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Aliquot Mass/Volume 10 (g)
Extract/Digestate Volume 155 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0942	0.0232	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91209090001

Lab Sample ID CCB
File # Z4120909-29
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 10:15:48

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000034 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91209090002

Lab Sample ID CCB
File # Z4120909-43
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 10:53:10

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000006 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91209090002

Lab Sample ID CCB
File # Z4120909-59
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 11:35:54

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	0.0000036 J	0.000030	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91209090002

Lab Sample ID CCB
File # Z4120909-67
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 11:57:23

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000009 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91209090000

Lab Sample ID ICB
File # Z4120909-10
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 09:24:55

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000007 J	0.000030	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Lab Sample ID BLK993646
File # Z4120909-30
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Prepared 12/07/99
Date Analyzed 12/09/99 10:18:30

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T

Analyte	Aliquot Mass/Volume 10 (g) Extract/Digestate Volume 150 (mL) Dilution Factor 5 — Measured Conc. ug	Detection Limit ug	Reporting Limit ug
Mercury	-0.0218 J	0.0225	1000

LABORATORY CONTROL SAMPLE

Digestion Batch # GD1G991207105000

Analysis Batch # AAZ4 91209090002

Method Mercury by SW7470A

Test Code HGCSWA00

Date Prepared 12/07/99

Date Analyzed 12/09/99 10:26:42

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As

% Moisture

Aliquot Mass or Vol 50 (mL)

Extract Mass or Vol 50 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995777 File ID Z4120909-32			LCS Duplicate Lab Sample ID LCS995777 File ID Z4120909-33			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.0100	0.0101	101	0.0100	0.0100	100	82	123	1.00	13

MATRIX SPIKE(S)

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Work Order # 9911511

Project Sample ID REL-1205
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:14:43

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Spike Sol'n #	Vol. Added
Surrogate Sol'n	**Vol. Added**

Sample	Spiked Sample	Spiked Sample Dup	Recovery Specification Limits	RPD
Lab Sample ID: 9911511-03A	Lab Sample ID: 9911511-17A MS	Lab Sample ID: 9911511-18A MSD		
File # Z4120909-46	File # Z4120909-50	File # Z4120909-51		
Aliquot Mass/Vol: 10 (g)	Aliquot Mass/Vol: 10 (g)	Aliquot Mass/Vol: 10 (g)		
Extract Mass/Vol: 118 (mL)	Extract Mass/Vol: 118 (mL)	Extract Mass/Vol: 118 (mL)		
Dil Fact. 5	Dil Fact. 5	Dil Fact. 5		

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc. ug	Measured Conc. ug	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	0.002	0.637	1.18	1.82	100	1.18	1.83	101	70	130	1.00	25

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91209090001
Initial Calibration # Z4991209090000

Lab Sample ID CCV
File # Z4120909-28
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/09/99 10:13:05

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00971	0.0100	97	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91209090002
Initial Calibration # Z4991209090000

Lab Sample ID CCV
File # Z4120909-42
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/09/99 10:50:30

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00983	0.0100	98	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91209090002
Initial Calibration # Z4991209090000

Lab Sample ID CCV
Date Analyzed 12/09/99 11:33:13
Reporting Subset ___
Instrument Z4
File # Z4120909-58
Spikes Subset ___
Analyst RWG
Method Mercury by SW7470A
Specs Subset ___
Reviewer MOS
Test Code HGCSWA00

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00975	0.0100	98	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91209090002
Initial Calibration # Z4991209090000

Lab Sample ID CCV
File # Z4120909-66
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/09/99 11:54:42

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00971	0.0100	97	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91209090000
Initial Calibration # Z4991209090000

Lab Sample ID ICV
File # Z4120909-9
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/09/99 09:22:13

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00974	0.0100	97	90	110

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1105
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 10:58:34

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-01A Dil Fact. 5	Duplicate Lab Sample ID 9911511-01A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.236	0.214	9.6	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:03:59

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-03A Dil Fact. 5	Duplicate Lab Sample ID 9911511-03A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.637	0.652	2.4	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Date Collected 11/16/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/09/99 11:06:42

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix T

Report As received

	Sample Lab Sample ID 9911511-03A Dil Fact. 5	Duplicate Lab Sample ID 9911511-03A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.637	0.648	1.7	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1305
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:19:58

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-05A Dil Fact. 5	Duplicate Lab Sample ID 9911511-05A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.359	0.354	1.5	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1405
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:25:15

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-07A Dil Fact. 5	Duplicate Lab Sample ID 9911511-07A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0548	0.0554	1.0	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1155
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:30:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-09A Dil Fact. 5	Duplicate Lab Sample ID 9911511-09A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.948	0.931	1.8	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1255
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:41:16

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-11A Dil Fact. 5	Duplicate Lab Sample ID 9911511-11A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	1.25	1.26	1.5	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1355
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:46:40

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received

	Sample Lab Sample ID 9911511-13A Dil Fact. 5	Duplicate Lab Sample ID 9911511-13A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	1.45	1.47	1.5	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207105000

Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1455

Method Metals Train Hg by SW7470A

Test Code HGCBTA00

Date Collected 11/17/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/09/99 11:52:01

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix T

Report As received

	Sample Lab Sample ID 9911511-15A Dil Fact. 5	Duplicate Lab Sample ID 9911511-15A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0817	0.0942	14 Q	10

ANALYTICAL SPIKE(S)

Digestion Batch # GDIG991207105000
Analysis Batch # AAZ4 91209090002

Project Sample ID REL-1205
Method Metals Train Hg by SW7470A
Test Code HGCBTA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/09/99 11:09:25

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix T
Report As received
% Moisture

Spike Sol'n #	Vol. Added
Surrogate Sol'n	**Vol. Added**

Sample
Lab Sample ID 9911511-03A
File # Z4120909-46
Aliquot Mass/Vol 10 (g)
Extract Mass/Vol 118 (mL)
Dil Fact. 5

Spiked Sample
Lab Sample ID 9911511-03A
File # Z4120909-49
Aliquot Mass/Vol 10 (g)
Extract Mass/Vol 118 (mL)
Dil Fact. 5.555

Spiked Sample Dup
Lab Sample ID
File #
Aliquot Mass/Vol
Extract Mass/Vol
Dil Fact.

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc.	Measured Conc.	Rec. %	Recovery Specification Limits Low %	High %	RPD Result %	Specification Limit %
Mercury	.002	0.637	1.31	1.91	97				85	115		

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Mercury by SW-846 Specification# HGCS

Lab Sample ID / File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

QUALITY CONTROL EXCEPTION REPORT
SUMMARY

QCER #	Analysis Batch Number
991209-02	Z49912090900

QUALITY CONTROL EXCEPTION REPORT **REPORT COPY 9911511**
LEVEL 2 - ANALYTICAL

QCER # 991209-02 **Revised: 12/10/99**

Analyst: RWG Instrument: Z4 Date Analyzed: 12/09/99
Batch #: Z49912090900 Matrix: nit/per BT Status: C
Prot Spec: 3.018 Analysis File #: _____ Analyte: HG

Lab Sample ID:	Client ID:	CSC:	Project Sample ID:
9911511	RELIANT_HG	DPM	
9911545			

SAMPLE PREPARATION:

PROBLEM IDENTIFICATION
- Sample Went Dry _
- Loss of ____ % of Sample _
- Emulsion Formed _
- Blank Contamination _
- Instrument _
- Hold Time _
- MS/MSD Not Available _
- Instrument _
- Other (Describe) _

CORRECTIVE ACTION TAKEN
- Reprepare Sample _
- Sample Sent for Analysis _
- Resample _
- Other (Describe) _

Comments: _____

SAMPLE ANALYSIS:

PROBLEM IDENTIFICATION
- Surrogate Recovery _
- MS/MSD Recovery _
- LCS/LCSD Recovery _
- MS/MSD Precision _
- LCS/LCSD Precision _
- Standard _
- Blank Contamination _
- Instrument _
- Hold Time _
- No MS/MSD Available for Batch _
- Sample pH _
- Dil. Due to Hi-Level Non-Target Analytes _
- Serial Dilution _
- Analytical Spike _
- Internal Standard _
- Other (Describe) X
  sample dup RPD out

PROBABLE CAUSE
- Matrix Effect _
- Instrument _
- Spiking Error _
- Contamination _
- Coelution _
- Unknown _
- Other(Describe) X
  LOW LEVEL

CORRECTIVE ACTION TAKEN
- Reprepare Sample _
- Reanalyze Sample _
- Reanalyze LCS/LCSD _
- Recalibrate Instrument _
- Analyze Out of Hold Time _
- Prepare New Standard _
- Flag Data X
- Resample _
- Analyze by MSA _
- Perform Analytical Spike _
- No Action Required _
- Level 3 QCER to Follow _
- Other (Describe) _

Comments: RPD outside tolerance for sample -15A at 14%. This is due to Hg values below the detection limit having high RPD values as expected. The sample was not re-ran due to an oversight. Also, in this batch a serial dilution was not performed, however

the corrective action to a failing serial dilution (to run an analytical spike) was performed.

RADIAN ANALYTICAL SERVICES
FPAS REPORT
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Work Order # 9911508

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG

Certified By [signature]
Date 12/10/99

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12/10/99 15:42:03

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911508
Page 1

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-1106	01A	HGCBKA00	Mercury by CVAAS
REL-1206	02A	HGCBKA00	Mercury by CVAAS
REL-1306	03A	HGCBKA00	Mercury by CVAAS
REL-1406	04A	HGCBKA00	Mercury by CVAAS
REL-1156	05A	HGCBKA00	Mercury by CVAAS
REL-1256	06A	HGCBKA00	Mercury by CVAAS
REL-1356	07A	HGCBKA00	Mercury by CVAAS
REL-1456	08A	HGCBKA00	Mercury by CVAAS
REL-1156	09A MS	HGCBKA00	Mercury by CVAAS
	10A MSD	HGCBKA00	Mercury by CVAAS

WORK ORDER COMMENTS

Post digestion spikes not performed on all GFAAS analyses per Item 271 of the New York ELAP manual. Post digestion spikes were performed, as necessary, when recoveries for serial dilutions or matrix spikes for an analytical batch did not fall within recovery tolerances.

Total Sample Volumes (mL)

01A - 475
02A - 530
03A - 525
04A - 455
05A - 505
06A - 430
07A - 500
08A - 510

STATE CERTIFICATIONS

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG
Method Mercury by SW-846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
REL-1106	9911508-01A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1106	9911508-01A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1156	9911508-05A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1156	9911508-05A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1156	9911508-05A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1206	9911508-02A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1206	9911508-02A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1256	9911508-06A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1256	9911508-06A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1306	9911508-03A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1306	9911508-03A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1356	9911508-07A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1356	9911508-07A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1406	9911508-04A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1406	9911508-04A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1456	9911508-08A	HGCBKA00	GDIG991207102000	AAZ4__91208133601
REL-1456	9911508-08A	HGCBKA00	GDIG991207102000	AAZ4__91208133601

RESULTS SUMMARY

Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Project Sample ID:	REL-1106		REL-1106		REL-1156		REL-1156	
Lab ID:	9911508-01A		9911508-01A		9911508-05A		9911508-05A	
File ID:	Z4120813-25		Z4120813-26		Z4120813-40		Z4120813-41	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 15:08:01		12/08/99 15:10:42		12/08/99 16:00:15		12/08/99 16:02:56	
Dilution Factor:	5		5		5		5	
Matrix:	Train-KMNO4		Train-KMNO4		Train-KMNO4		Train-KMNO4	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	22.2	0.0712	22.0	0.0712	19.3	0.0758	19.4	0.0758

RESULTS SUMMARY (Cont'd)

Method Hg, KMnO4/H2SO4 Impinger

Test Code HGCBKA00

Project Sample ID:	REL-1156		REL-1206		REL-1206		REL-1256	
Lab ID:	9911508-05A		9911508-02A		9911508-02A		9911508-06A	
File ID:	Z4120813-42		Z4120813-28		Z4120813-32		Z4120813-51	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 16:05:36		12/08/99 15:16:09		12/08/99 15:29:31		12/08/99 16:41:08	
Dilution Factor:	5		5		5		5	
Matrix:	Train-KMNO4		Train-KMNO4		Train-KMNO4		Train-KMNO4	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	19.3	0.0758	22.5	0.0795	21.5	0.0795	18.7	0.0645

Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Project Sample ID:	REL-1256		REL-1306		REL-1306		REL-1356	
Lab ID:	9911508-06A		9911508-03A		9911508-03A		9911508-07A	
File ID:	Z4120813-52		Z4120813-38		Z4120813-39		Z4120813-53	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 16:43:52		12/08/99 15:51:42		12/08/99 15:54:20		12/08/99 16:50:00	
Dilution Factor:	5		5		5		5	
Matrix:	Train-KMNO4		Train-KMNO4		Train-KMNO4		Train-KMNO4	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	18.5	0.0645	26.9	0.0788	26.9	0.0788	18.4	0.0750

Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Project Sample ID:	REL-1356		REL-1406		REL-1406		REL-1456	
Lab ID:	9911508-07A		9911508-04A		9911508-04A		9911508-08A	
File ID:	Z4120813-54		Z4120813-34		Z4120813-36		Z4120813-55	
Date Collected:	11/16/99		11/17/99		11/17/99		11/17/99	
Date Prepared:	12/07/99		12/07/99		12/07/99		12/07/99	
Date Analyzed:	12/08/99 16:52:41		12/08/99 15:35:52		12/08/99 15:42:19		12/08/99 16:55:17	
Dilution Factor:	5		1		1		1	
Matrix:	Train-KMNO4		Train-KMNO4		Train-KMNO4		Train-KMNO4	
Units:	ug		ug		ug		ug	
Report as:	received		received		received		received	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	18.3	0.0750	0.0429	0.0136	0.0464	0.0136	0.115	0.0153

Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Project Sample ID:	REL-1456							
Lab ID:	9911508-08A							
File ID:	Z4120813-56							
Date Collected:	11/17/99							
Date Prepared:	12/07/99							
Date Analyzed:	12/08/99 16:59:39							
Dilution Factor:	1							
Matrix:	Train-KMNO4							
Units:	ug							
Report as:	received							
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.117	0.0153						

12/10/99 15:32:03

INITIAL CALIBRATION

Work Order # 9911508

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Initial Calibration # Z4991208133600

Calibration Date 12/08/99 13:36:00

Sol'n # _____

Method Mercury by SW-846

Test Code HGCSWA00

Instrument Z4

Analyst RWG

Reviewer MOS

Analytes	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Correlation Coefficient
Mercury	0.000 0	0.0036529 0.0005	0.0085492 0.001	0.0161992 0.002	0.0345505 0.004	0.0822655 0.010	0.1656997 0.020	1.000

Specification Limits for correlation coefficient >0.995

DIGESTION BATCH SUMMARY

Digestion Batch # GDIG991207102000

Method Digestion by SW7470A
Test Code DHGSWA00

Extraction Start Date/Time 12/07/99 10:20:00
Extraction Stop Date/Time

Analyst RWG
Reviewer PRS

Sample	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
1	REL-1106	9911508-01A	10	
2	REL-1206	9911508-02A	10	
3	REL-1306	9911508-03A	10	
4	REL-1406	9911508-04A	10	
5	REL-1156	9911508-05A	10	
6	REL-1256	9911508-06A	10	
7	REL-1356	9911508-07A	10	
8	REL-1456	9911508-08A	10	
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Quality Control	Project Sample ID	Lab Sample ID	Sample Size mL	Cleanup Method
Blank		BLK993641	10	
Detectability Check Sample		DCS995770	50	
Laboratory Control Sample		LCS995771	50	
Laboratory Control Sample Duplicate		LCSD995771	50	
Matrix Spike	REL-1156	9911508-09A	10	
Matrix Spike Duplicate	REL-1156	9911508-10A	10	

ANALYSIS BATCH SUMMARY

Analysis Batch # AAZ4 91208133601

Work Order # 9911508

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991208133600
Calibration Date 12/08/99

Analysis Start Date/Time 12/08/99 13:36:00
Analysis Stop Date/Time 12/08/99 18:27:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1	12/08/99 13:37:43		S_0	Initial Calibration Blank	Z4120813-1
2	12/08/99 13:40:22		S_05	Initial Calibration Standard 1	Z4120813-2
3	12/08/99 13:43:02		S_1	Initial Calibration Standard 2	Z4120813-3
4	12/08/99 13:45:42		S_2	Initial Calibration Standard 3	Z4120813-4
5	12/08/99 13:48:24		S_4	Initial Calibration Standard 4	Z4120813-5
6	12/08/99 13:51:06		S_10	Initial Calibration Standard 5	Z4120813-6
7	12/08/99 13:53:49		S_20	Initial Calibration Standard 6	Z4120813-7
8	12/08/99 13:58:19		ICV	Initial Calibration Verification	Z4120813-8
9	12/08/99 14:01:01		ICB	Blank, Initial Calibration	Z4120813-9
10	12/08/99 14:03:40		BLK993643	Blank, Method	Z4120813-10
11	12/08/99 14:06:19		DCS995770	Detectability Check Sample	Z4120813-11
12	12/08/99 14:08:58		LCS995771	Lab Control Sample	Z4120813-12
13	12/08/99 14:11:38		LCSD995771	Lab Control Sample Duplicate	Z4120813-13
14	12/08/99 14:14:20	REL-1106	9911508-01A	Sample	Z4120813-14
15	12/08/99 14:17:02	REL-1106	9911508-01A	Sample Duplicate	Z4120813-15
16	12/08/99 14:19:45	REL-1206	9911508-02A	Sample	Z4120813-16
17	12/08/99 14:25:07		A991150803A	Sample	Z4120813-17
18	12/08/99 14:28:34		A991150803A	Sample Duplicate	Z4120813-18
19	12/08/99 14:33:22		A991150801A	Sample	Z4120813-19
20	12/08/99 14:36:06		A991150801A	Sample Duplicate	Z4120813-20
21	12/08/99 14:37:34		A991150802A	Sample	Z4120813-21
22	12/08/99 14:49:19		ASample008	Sample	Z4120813-22
23	12/08/99 14:54:36		CCV	Continuing Calibration Verification	Z4120813-23
24	12/08/99 14:57:18		CCB	Blank, Continuing Calibration	Z4120813-24
25	12/08/99 15:08:01	REL-1106	9911508-01A	Sample	Z4120813-25
26	12/08/99 15:10:42	REL-1106	9911508-01A	Sample Duplicate	Z4120813-26
27	12/08/99 15:13:25	REL-1206	9911508-02A	Sample	Z4120813-27
28	12/08/99 15:16:09	REL-1206	9911508-02A	Sample Duplicate	Z4120813-28
29	12/08/99 15:18:54		CCV	Continuing Calibration Verification	Z4120813-29
30	12/08/99 15:21:35		CCB	Blank, Initial Calibration	Z4120813-30

ANALYSIS BATCH SUMMARY (cont'd)

Analysis Batch # AAZ4 91208133601

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991208133600
Calibration Date 12/08/99

Analysis Start Date/Time 12/08/99 13:36:00
Analysis Stop Date/Time 12/08/99 18:27:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
31	12/08/99 15:25:11		AICB	Sample	Z4120813-31
32	12/08/99 15:29:31	REL-1206	9911508-02A	Sample	Z4120813-32
33	12/08/99 15:33:14	REL-1306	9911508-03A	Sample Duplicate	Z4120813-33
34	12/08/99 15:35:52	REL-1406	9911508-04A	Sample	Z4120813-34
35	12/08/99 15:39:41	REL-1306	9911508-03A	Sample	Z4120813-35
36	12/08/99 15:42:19	REL-1406	9911508-04A	Sample Duplicate	Z4120813-36
37	12/08/99 15:44:59	REL-1156	9911508-05A	Sample	Z4120813-37
38	12/08/99 15:51:42	REL-1306	9911508-03A	Sample	Z4120813-38
39	12/08/99 15:54:20	REL-1306	9911508-03A	Sample Duplicate	Z4120813-39
40	12/08/99 16:00:15	REL-1156	9911508-05A	Sample	Z4120813-40
41	12/08/99 16:02:56	REL-1156	9911508-05A	Sample Duplicate	Z4120813-41
42	12/08/99 16:05:36	REL-1156	9911508-05A	Sample Duplicate	Z4120813-42
43	12/08/99 16:08:17		CCV	Continuing Calibration Verification	Z4120813-43
44	12/08/99 16:10:58		CCB	Blank, Continuing Calibration	Z4120813-44
45	12/08/99 16:15:51	REL-1156	9911508-05A	Analytical Spike	Z4120813-45
46	12/08/99 16:18:33	REL-1156	9911508-09A	Matrix Spike	Z4120813-46
47	12/08/99 16:21:15	REL-1156	9911508-10A	Matrix Spike Duplicate	Z4120813-47
48	12/08/99 16:23:58	REL-1256	9911508-06A	Sample	Z4120813-48
49	12/08/99 16:35:42	REL-1356	9911508-07A	Sample	Z4120813-49
50	12/08/99 16:38:25	REL-1156	9911508-05A	Analytical Spike	Z4120813-50
51	12/08/99 16:41:08	REL-1256	9911508-06A	Sample	Z4120813-51
52	12/08/99 16:43:52	REL-1256	9911508-06A	Sample Duplicate	Z4120813-52
53	12/08/99 16:50:00	REL-1356	9911508-07A	Sample	Z4120813-53
54	12/08/99 16:52:41	REL-1356	9911508-07A	Sample Duplicate	Z4120813-54
55	12/08/99 16:55:17	REL-1456	9911508-08A	Sample	Z4120813-55
56	12/08/99 16:59:39	REL-1456	9911508-08A	Sample Duplicate	Z4120813-56
57	12/08/99 17:02:18		CCV	Continuing Calibration Verification	Z4120813-57
58	12/08/99 17:04:56		CCB	Blank, Continuing Calibration	Z4120813-58

RESULTS

Work Order # 9911508

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1106
Lab Sample ID 9911508-01A
File # Z4120813-25
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:08:01

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 475 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	22.2	0.0712	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1106
Lab Sample ID 9911508-01A
File # Z4120813-26
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:10:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 475 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	22.0	0.0712	1000

RESULTS

Work Order # 9911508

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1206
Lab Sample ID 9911508-02A
File # Z4120813-28
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:16:09

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 530 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	22.5	0.0795	1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1206
Lab Sample ID 9911508-02A
File # Z4120813-32
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:29:31

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 530 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	21.5	0.0795	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1406
Lab Sample ID 9911508-04A
File # Z4120813-34
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:35:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 455 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0429	0.0136	1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1406
Lab Sample ID 9911508-04A
File # Z4120813-36
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:42:19

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 455 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.0464	0.0136	.1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1306
Lab Sample ID 9911508-03A
File # Z4120813-38
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:51:42

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 525 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	26.9	0.0788	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1306
Lab Sample ID 9911508-03A
File # Z4120813-39
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:54:20

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 525 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	26.9	0.0788	.1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1156
Lab Sample ID 9911508-05A
File # Z4120813-40
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:00:15

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 505 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	19.3	0.0758	-1000

RESULTS

Work Order # 9911508

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1156
Lab Sample ID 9911508-05A
File # Z4120813-41
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:02:56

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 50 (g) Extract/Digestate Volume 505 (mL) Dilution Factor 5 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	19.4	0.0758	1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1156
Lab Sample ID 9911508-05A
File # Z4120813-42
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:05:36

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 505 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	19.3	0.0758	.1000

RESULTS

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1256
Lab Sample ID 9911508-06A
File # Z4120813-51
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:41:08

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 430 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	18.7	0.0645	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1256
Lab Sample ID 9911508-06A
File # Z4120813-52
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:43:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 430 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	18.5	0.0645	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1356
Lab Sample ID 9911508-07A
File # Z4120813-53
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:50:00

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 500 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	18.4	0.0750	.1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1356
Lab Sample ID 9911508-07A
File # Z4120813-54
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:52:41

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 500 (mL)
Dilution Factor 5

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	18.3	0.0750	~1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1456
Lab Sample ID 9911508-08A
File # Z4120813-55
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:55:17

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Aliquot Mass/Volume 50 (g)
Extract/Digestate Volume 510 (mL)
Dilution Factor 1

Analyte	CAS #	Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.115	0.0153	-1000

RESULTS

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1456
Lab Sample ID 9911508-08A
File # Z4120813-56
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:59:39

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Analyte	CAS #	Aliquot Mass/Volume 50 (g) Extract/Digestate Volume 510 (mL) Dilution Factor 1 Measured Concentration ug	Detection Limit ug	Reporting Limit ug
Mercury	7439-97-6	0.117	0.0153	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91208133601

Lab Sample ID CCB
File # Z4120813-24
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 14:57:18

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000045 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91208133601

Lab Sample ID CCB
File # Z4120813-44
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 16:10:58

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 — Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000017 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91208133601

Lab Sample ID CCB
File # Z4120813-58
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 17:04:56

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000025 J	0.000030	.1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91208133600

Lab Sample ID ICB
File # Z4120813-9
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 14:01:01

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000032 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207100000
Analysis Batch # AAZ4 91208133601

Lab Sample ID CCB
File # Z4120813-30
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 15:21:35

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000038 J	0.000030	1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Lab Sample ID BLK993643
File # Z4120813-10
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Prepared 12/07/99
Date Analyzed 12/08/99 14:03:40

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K

Analyte	Aliquot Mass/Volume 50 (g) Extract/Digestate Volume 500 (mL) Dilution Factor 1 Measured Conc. ug	Detection Limit ug	Reporting Limit ug
Mercury	-0.0175 J	0.0150	-1000

12/10/99 15:32:03

LABORATORY CONTROL SAMPLE

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Work Order # 9911508

Method Mercury by SW7470A

Test Code HGCSWA00

Date Prepared 12/07/99

Date Analyzed 12/08/99 14:11:38

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As

% Moisture

Aliquot Mass or Vol 50 (mL)

Extract Mass or Vol 50 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995771 File ID Z4120813-12			LCS Duplicate Lab Sample ID LCSD995771 File ID Z4120813-13			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.0100	0.00985	98	0.0100	0.00946	95	82	123	3.1	13

MATRIX SPIKE(S)

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Work Order # 9911508

Project Sample ID REL-1156
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:21:15

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Spike Sol'n #	Vol. Added	Sample Lab Sample ID 9911508-05A File # Z4120813-40 Aliquot Mass/Vol 50 (g) Extract Mass/Vol 505 (mL) Dil Fact. 5	Spiked Sample Lab Sample ID 9911508-09A MS File # Z4120813-46 Aliquot Mass/Vol 50 (g) Extract Mass/Vol 505 (mL) Dil Fact. 5	Spiked Sample Dup Lab Sample ID 9911508-10A MSD File # Z4120813-47 Aliquot Mass/Vol 50 (g) Extract Mass/Vol 505 (mL) Dil Fact. 5	Recovery Specification Limits	RPD
Surrogate Sol'n	Vol. Added					

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc. ug	Measured Conc. ug	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	.002	19.3	1.01	21.5	218 Q	1.01	20.6	128	70	130	52 Q	25

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208133601
Initial Calibration # Z4991208133600

Lab Sample ID CCV
File # Z4120813-23
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 14:54:36

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00957	0.0100	96	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208133601
Initial Calibration # Z4991208133600

Lab Sample ID CCV
File # Z4120813-29
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 15:18:54

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00953	0.0100	95	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208133601
Initial Calibration # Z4991208133600

Lab Sample ID CCV
File # Z4120813-43
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 16:08:17

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0103	0.0100	103	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208133601
Initial Calibration # Z4991208133600

Lab Sample ID CCV
File # Z4120813-57
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 17:02:18

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0102	0.0100	102	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91208133600

Initial Calibration # Z4991208133600

Lab Sample ID ICV
File # Z4120813-8
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/08/99 13:58:19

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00969	0.0100	97	90	110

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1106

Method Hg, KMnO4/H2SO4 Impinger

Test Code HGCBKA00

Date Collected 11/16/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/08/99 15:10:42

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix K

Report As received

	Sample Lab Sample ID 9911508-01A Dil Fact. 5	Duplicate Lab Sample ID 9911508-01A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	22.2	22.0	0.71	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1206
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:16:09

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-02A Dil Fact. 5	Duplicate Lab Sample ID 9911508-02A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	21.5	22.5	4.6	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1406

Method Hg, KMnO4/H2SO4 Impinger

Test Code HGCBKA00

Date Collected 11/17/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/08/99 15:42:19

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix K

Report As received

	Sample Lab Sample ID 9911508-04A Dil Fact. 1	Duplicate Lab Sample ID 9911508-04A Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.0429	0.0464	8.0	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1306
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 15:54:20

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-03A Dil Fact. 5	Duplicate Lab Sample ID 9911508-03A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	26.9	26.9	0.063	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1156
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:02:56

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-05A Dil Fact. 5	Duplicate Lab Sample ID 9911508-05A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	19.3	19.4	0.23	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1156

Method Hg, KMnO4/H2SO4 Impinger

Test Code HGCBKA00

Date Collected 11/16/99

Date Received 11/19/99

Date Prepared 12/07/99

Date Analyzed 12/08/99 16:05:36

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix K

Report As received

	Sample Lab Sample ID 9911508-05A Dil Fact. 5	Duplicate Lab Sample ID 9911508-05A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	19.3	19.3	0.0052	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1256
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:43:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-06A Dil Fact. 5	Duplicate Lab Sample ID 9911508-06A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	18.7	18.5	1.1	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1356
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:52:41

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-07A Dil Fact. 5	Duplicate Lab Sample ID 9911508-07A Dil Fact. 5	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	18.4	18.3	0.67	10

SAMPLE DUPLICATES

Digestion Batch # GDIG991207102000

Analysis Batch # AAZ4 91208133601

Project Sample ID REL-1456
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/17/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:59:39

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received

	Sample Lab Sample ID 9911508-08A Dil Fact. 1	Duplicate Lab Sample ID 9911508-08A Dil Fact. 1	RPD	
Analyte	Measured Conc. ug	Measured Conc. ug	Result	Specification Limit %
Mercury	0.115	0.117	1.3	10

ANALYTICAL SPIKE(S)

Digestion Batch # GDIG991207102000
Analysis Batch # AAZ4 91208133601

Work Order # 9911508

Project Sample ID REL-1156
Method Hg, KMnO4/H2SO4 Impinger
Test Code HGCBKA00

Date Collected 11/16/99
Date Received 11/19/99
Date Prepared 12/07/99
Date Analyzed 12/08/99 16:38:25

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix K
Report As received
% Moisture

Spike Sol'n #	Vol. Added
Surrogate Sol'n	**Vol. Added**

Sample	Spiked Sample	Spiked Sample Dup
Lab Sample ID: 9911508-05A	Lab Sample ID: 9911508-05A	Lab Sample ID:
File # Z4120813-40	File # Z4120813-50	File #
Aliquot Mass/Vol: 50 (g)	Aliquot Mass/Vol: 50 (g)	Aliquot Mass/Vol:
Extract Mass/Vol: 505 (mL)	Extract Mass/Vol: 505 (mL)	Extract Mass/Vol:
Dil Fact. 5	Dil Fact. 5.555	Dil Fact.

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. ug	Spiked Conc. ug	Measured Conc. ug	Rec. %	Spiked Conc.	Measured Conc.	Rec. %	Recovery Specification Limits Low %	High %	RPD Result %	Specification Limit %
Mercury	.002	19.3	5.61	26.1	121 Q				85	115		

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Mercury by SW-846 Specification# HGCS

Lab Sample ID / File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

QUALITY CONTROL EXCEPTION REPORT
SUMMARY

QCER #	Analysis Batch Number
991208-01	Z4991208133601

QUALITY CONTROL EXCEPTION REPORT
LEVEL 2 - ANALYTICAL

REPORT COPY 9911508

QCER # 991208-01

Revised: 12/09/99

Analyst: RWG Instrument: Z4 Date Analyzed: 12/08/99
Batch #: Z4991208133601 Matrix: KMnO4 imp Status: C
Prot Spec: 3.018 Analysis File #: Analyte: HG

Lab Sample ID:	Client ID:	CSC:	Project Sample ID:
9911508	RELIANT_HG	DPM	

SAMPLE PREPARATION:

PROBLEM IDENTIFICATION

- Sample Went Dry _
- Loss of ____ % of Sample _
- Emulsion Formed _
- Blank Contamination _
- Instrument _
- Hold Time _
- MS/MSD Not Available _
- Instrument _
- Other (Describe) _

CORRECTIVE ACTION TAKEN

- Reprepare Sample _
- Sample Sent for Analysis _
- Resample _
- Other (Describe) _

Comments:

SAMPLE ANALYSIS:

PROBLEM IDENTIFICATION		PROBABLE CAUSE		CORRECTIVE ACTION TAKEN	
Surrogate Recovery	_	Matrix Effect	_	Reprepare Sample	_
MS/MSD Recovery	X	Instrument	_	Reanalyze Sample	_
LCS/LCSD Recovery	_	Spiking Error	_	Reanalyze LCS/LCSD	_
MS/MSD Precision	X	Contamination	_	Recalibrate Instrument	_
LCS/LCSD Precision	_	Coelution	_	Analyze Out of Hold Time	_
Standard	_	Unknown	_	Prepare New Standard	_
Blank Contamination	_	Other(Describe)	X	Flag Data	X
Instrument	_			Resample	_
Hold Time	_			Analyze by MSA	_
No MS/MSD Available for Batch	_			Perform Analytical Spike	_
Sample pH	_			No Action Required	_
Dil. Due to Hi-Level	_			Level 3 QCER to Follow	_
Non-Target Analytes				Other (Describe)	_
Serial Dilution	_				
Analytical Spike	X				
Internal Standard	_				
Other (Describe)	_				

Comments: MS/D recovery was 218 & 128 % with a RPD of 52. Do to the native mercury concentration in the parent sample (an order of magnitude greater than the spike level) it is difficult to quantify spikes at this level. This also applies to

Distribution: CSC, Lab, Report

the analytical spike which failed high at 121%. LCS/D recoveries were inside tolerances at 98 & 95.

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FAX: (303) 373-4791

December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL11
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417637

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.74	xxxxxx
% Ash	12.36	18.11
% Volatile	29.06	42.57
% Fixed Carbon	26.84	39.32
	100.00	100.00
Btu/lb	7153	10479
% Sulfur	0.83	1.22
MAF Btu/lb		12796
% MAF Volatile		51.98
% MAF Fixed Carbon		48.02
lb SO_2/mm Btu		2.32
% Air Dry Loss		21.22

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.74	xxxxx
% Carbon	41.66	61.03
% Hydrogen	3.09	4.52
% Nitrogen	0.77	1.13
% Sulfur	0.83	1.22
% Ash	12.36	18.11
% Oxygen (diff)	9.55	13.99
	100.00	100.00
lb Sulfur/mm Btu		1.16
As Received Net Sample Wt.		1249.40 g

Apparent Specific Gravity = 1.32
Chlorine, ug/g (Dry Basis)= <100

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Denver Laboratory

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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL12
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417638

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	32.00	xxxxxx
% Ash	12.52	18.41
% Volatile	28.96	42.59
% Fixed Carbon	26.52	39.00
	100.00	100.00
Btu/lb	7106	10450
% Sulfur	0.87	1.28
MAF Btu/lb		12808
% MAF Volatile		52.20
% MAF Fixed Carbon		47.80
lb SO_2/mm Btu		2.45
% Air Dry Loss		19.59

Apparent Specific Gravity = 1.33
Chlorine, ug/g (Dry Basis)= <100

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	32.00	xxxxx
% Carbon	41.44	60.94
% Hydrogen	3.11	4.57
% Nitrogen	0.76	1.12
% Sulfur	0.87	1.28
% Ash	12.52	18.41
% Oxygen (diff)	9.30	13.68
	100.00	100.00
lb Sulfur/mm Btu		1.22
As Received Net Sample Wt.		1157.40 g

Respectfully submitted,
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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL13
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417639

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.13	xxxxxx
% Ash	14.00	20.33
% Volatile	29.15	42.32
% Fixed Carbon	25.72	37.35
	100.00	100.00
Btu/lb	7118	10336
% Sulfur	1.10	1.60
MAF Btu/lb		12974
% MAF Volatile		53.12
% MAF Fixed Carbon		46.88
lb SO_2/mm Btu		3.09
% Air Dry Loss		20.07

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.13	xxxxx
% Carbon	41.24	59.88
% Hydrogen	3.11	4.52
% Nitrogen	0.74	1.08
% Sulfur	1.10	1.60
% Ash	14.00	20.33
% Oxygen (diff)	8.68	12.59
	100.00	100.00
lb Sulfur/mm Btu		1.55
As Received Net Sample Wt.		1164.70 g

Apparent Specific Gravity = 1.33
Chlorine, ug/g (Dry Basis) = <100

Respectfully submitted,
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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL21
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417640

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.80	xxxxxx
% Ash	12.05	17.67
% Volatile	29.31	42.98
% Fixed Carbon	26.84	39.35
	100.00	100.00
Btu/lb	7266	10654
% Sulfur	1.03	1.51
MAF Btu/lb		12941
% MAF Volatile		52.20
% MAF Fixed Carbon		47.80
lb SO_2/mm Btu		2.84
% Air Dry Loss		19.62

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.80	xxxxx
% Carbon	42.26	61.97
% Hydrogen	3.19	4.68
% Nitrogen	0.77	1.13
% Sulfur	1.03	1.51
% Ash	12.05	17.67
% Oxygen (diff)	8.90	13.04
	100.00	100.00
lb Sulfur/mm Btu		1.42
As Received Net Sample Wt.		1319.20 g

Apparent Specific Gravity = 1.32
Chlorine, ug/g (Dry Basis) = <100

Respectfully submitted,
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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL22
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417641

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.46	xxxxxx
% Ash	12.36	18.03
% Volatile	29.42	42.92
% Fixed Carbon	26.76	39.05
	100.00	100.00
Btu/lb	7300	10650
% Sulfur	1.08	1.57
MAF Btu/lb		12993
% MAF Volatile		52.36
% MAF Fixed Carbon		47.64
lb SO_2/mm Btu		2.96
% Air Dry Loss		18.55

Apparent Specific Gravity = 1.31
Chlorine, ug/g (Dry Basis) = <100

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.46	xxxxx
% Carbon	42.28	61.68
% Hydrogen	3.15	4.59
% Nitrogen	0.77	1.12
% Sulfur	1.08	1.57
% Ash	12.36	18.03
% Oxygen (diff)	8.90	13.01
	100.00	100.00
lb Sulfur/mm Btu		1.48
As Received Net Sample Wt.		1254.30 g

Respectfully submitted,
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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL23
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417642

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	32.11	xxxxxx
% Ash	11.29	16.63
% Volatile	29.42	43.33
% Fixed Carbon	27.18	40.04
	100.00	100.00
Btu/lb	7329	10796
% Sulfur	1.00	1.48
MAF Btu/lb		12950
% MAF Volatile		51.97
% MAF Fixed Carbon		48.03
lb SO_2/mm Btu		2.73
% Air Dry Loss		18.82

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	32.11	xxxxx
% Carbon	42.31	62.32
% Hydrogen	3.12	4.60
% Nitrogen	0.75	1.11
% Sulfur	1.00	1.48
% Ash	11.29	16.63
% Oxygen (diff)	9.42	13.86
	100.00	100.00
lb Sulfur/mm Btu		1.36
As Received Net Sample Wt.		1489.40 g

Apparent Specific Gravity = 1.30
Chlorine, ug/g (Dry Basis)= <100

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL31
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417643

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.49	xxxxxx
% Ash	12.56	18.34
% Volatile	29.43	42.96
% Fixed Carbon	26.52	38.70
	100.00	100.00
Btu/lb	7279	10625
% Sulfur	1.10	1.61
MAF Btu/lb		13011
% MAF Volatile		52.61
% MAF Fixed Carbon		47.39
lb SO_2/mm Btu		3.02
% Air Dry Loss		18.47

Apparent Specific Gravity = 1.31
Chlorine, ug/g (Dry Basis) = <100

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.49	xxxxx
% Carbon	42.13	61.50
% Hydrogen	3.15	4.60
% Nitrogen	0.77	1.12
% Sulfur	1.10	1.61
% Ash	12.56	18.34
% Oxygen (diff)	8.80	12.83
	100.00	100.00
lb Sulfur/mm Btu		1.51
As Received Net Sample Wt.		1332.20 g

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL32
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417644

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.67	xxxxxx
% Ash	12.57	18.39
% Volatile	29.20	42.73
% Fixed Carbon	26.56	38.88
	100.00	100.00
Btu/lb	7229	10579
% Sulfur	1.00	1.47
MAF Btu/lb		12963
% MAF Volatile		52.36
% MAF Fixed Carbon		47.64
lb SO_2/mm Btu		2.77
% Air Dry Loss		18.88

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.67	xxxxx
% Carbon	42.12	61.64
% Hydrogen	3.11	4.55
% Nitrogen	0.77	1.13
% Sulfur	1.00	1.47
% Ash	12.57	18.39
% Oxygen (diff)	8.76	12.82
	100.00	100.00
lb Sulfur/mm Btu		1.38
As Received Net Sample Wt.		1365.30 g

Apparent Specific Gravity = 1.33
Chlorine, ug/g (Dry Basis) = <100

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Denver Laboratory

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December 13, 1999

RADIAN CORPORATION
P.O. Box 201088
Austin TX 78720

Sample identification by
RADIAN CORPORATION

SAMPLE ID : REL-COAL33
SAMPLE DATE: 11/16/99
PROJECT: REDIANT (803310)

Kind of sample COAL

Sample taken by RADIAN CORPORATION

Date received November 23, 1999

Analysis report no. 72-417645

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.81	xxxxxx
% Ash	12.77	18.72
% Volatile	29.13	42.72
% Fixed Carbon	26.29	38.56
	100.00	100.00
Btu/lb	7172	10517
% Sulfur	1.04	1.53
MAF Btu/lb		12939
% MAF Volatile		52.56
% MAF Fixed Carbon		47.44
lb SO_2/mm Btu		2.90
% Air Dry Loss		19.42

Apparent Specific Gravity = 1.32
Chlorine, ug/g (Dry Basis) = <100

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	31.81	xxxxx
% Carbon	41.56	60.95
% Hydrogen	3.06	4.49
% Nitrogen	0.76	1.11
% Sulfur	1.04	1.53
% Ash	12.77	18.72
% Oxygen (diff)	9.00	13.20
	100.00	100.00

lb Sulfur/mm Btu 1.45
As Received Net Sample Wt. 1187.40 g

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Denver Laboratory

MEMBER ACIL

P, Uit, Cl, Asg

RADIAN INTERNATIONAL LLC

Chain of Custody Record

Page 1 of 1

PROJECT: Reliant (#3310)

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	D5373 (CHN)	D4239	D3176 (S)	D2015 (O)	D3174 (HH)	D5142 (ASH)	% MOISTURE	D854 (DENS)	D4208 (CHLORIDE)				REMARKS
REL-COAL 11	COAL	11/12/99		1	X	X	X	X	X	X	X	X					72-417637
REL-COAL 12	↓	↓		1	X	X	X	X	X	X	X	X					72-417638
REL-COAL 13				1	X	X	X	X	X	X	X	X					72-417639
REL-COAL 21				1	X	X	X	X	X	X	X	X					72-417640
REL-COAL 22				1	X	X	X	X	X	X	X	X					72-417641
REL-COAL 23				1	X	X	X	X	X	X	X	X					72-417642
REL-COAL 31				1	X	X	X	X	X	X	X	X					72-417643
REL-COAL 32				1	X	X	X	X	X	X	X	X					72-417644
REL-COAL 33				1	X	X	X	X	X	X	X	X					72-417645

REMARKS

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
									[signature]	11/27/99	1600

RECEIVED NOV 29 1999 In Prep

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP °C	SEAL	CONDITION

REMARKS:

2850

RIC-41FH15-98-00037/cc FH5

RADIAN ANALYTICAL SERVICES
FPAS REPORT
TABLE OF CONTENTS

Work Order # 9911510

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG

Certified By [signature]
Date 12/30/99

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12/29/99 13:14:01

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911510
Page 1
RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-COAL 11	01A	PARRML00	Parr Bomb Ashing
	01B	HGCSSA00	Mercury by CVAAS
REL-COAL 12	02A	PARRML00	Parr Bomb Ashing
	02B	HGCSSA00	Mercury by CVAAS
REL-COAL 13	03A	PARRML00	Parr Bomb Ashing
	03B	HGCSSA00	Mercury by CVAAS
REL-COAL 21	04A	PARRML00	Parr Bomb Ashing
REL-COAL 21	04B	HGCSSA00	Mercury by CVAAS
REL-COAL 22	05A	PARRML00	Parr Bomb Ashing
REL-COAL 22	05B	HGCSSA00	Mercury by CVAAS
REL-COAL 23	06A	PARRML00	Parr Bomb Ashing
	06B	HGCSSA00	Mercury by CVAAS
REL-COAL 31	07A	PARRML00	Parr Bomb Ashing
	07B	HGCSSA00	Mercury by CVAAS
REL-COAL 32	08A	PARRML00	Parr Bomb Ashing
	08B	HGCSSA00	Mercury by CVAAS
REL-COAL 33	09A	PARRML00	Parr Bomb Ashing
	09B	HGCSSA00	Mercury by CVAAS
SARM 20	10A	PARRML00	Parr Bomb Ashing
	10B	HGCSSA00	Mercury by CVAAS
REL-COAL 11	11A MS	HGCSSA00	Mercury by CVAAS
	12A MSD	HGCSSA00	Mercury by CVAAS

Post digestion spikes not performed on all GFAAS analyses per Item 271 of the New York ELAP manual. Post digestion spikes were performed, as necessary, when recoveries for serial dilutions or matrix spikes for an analytical batch did not fall within recovery tolerances.

Mercury Digestion Batch : GDIG9912281010
Digestion Date: 12/28/99

Sample 9911510-10A is a SARM 20 sample. The true value of the SARM 20 is 0.25 mg/Kg. The value we obtained is 0.139 mg/Kg, resulting in a recovery of 56%.

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Client Code RELIANT HG
Method Mercury by SW-846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
REL-COAL 11	9911510-01B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 12	9911510-02B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 13	9911510-03B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 21	9911510-04B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 22	9911510-05B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 23	9911510-06B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 31	9911510-07B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 32	9911510-08B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
REL-COAL 33	9911510-09B	HGCSSA00	GDIG991227063000	AAZ4__91228142901
SARM 20	9911510-10B	HGCSSA00	GDIG991227063000	AAZ4__91228142901

RESULTS SUMMARY

Method Mercury by SW7471A

Test Code HGCSSA00

Project Sample ID:	REL-COAL 11		REL-COAL 12		REL-COAL 13		REL-COAL 21	
Lab ID:	9911510-01B		9911510-02B		9911510-03B		9911510-04B	
File ID:	Z4122814-24		Z4122814-29		Z4122814-30		Z4122814-31	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/28/99		12/28/99		12/28/99		12/28/99	
Date Analyzed:	12/28/99 15:41:51		12/28/99 15:55:11		12/28/99 15:57:50		12/28/99 16:00:31	
Dilution Factor:	2		2		2		2	
Matrix:	Solid		Solid		Solid		Solid	
Units:	mg/kg		mg/kg		mg/kg		mg/kg	
Report as:	dry weight		dry weight		dry weight		dry weight	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.102	0.00863	0.122	0.00869	0.140	0.00862	0.0979	0.00867

RESULTS SUMMARY (Cont'd)

Method Mercury by SW7471A
Test Code HGCSSA00

Project Sample ID:	REL-COAL 22		REL-COAL 23		REL-COAL 31		REL-COAL 32	
Lab ID:	9911510-05B		9911510-06B		9911510-07B		9911510-08B	
File ID:	Z4122814-32		Z4122814-33		Z4122814-34		Z4122814-35	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:	12/28/99		12/28/99		12/28/99		12/28/99	
Date Analyzed:	12/28/99 16:03:10		12/28/99 16:05:51		12/28/99 16:08:31		12/28/99 16:11:11	
Dilution Factor:	2		2		2		2	
Matrix:	Solid		Solid		Solid		Solid	
Units:	mg/kg		mg/kg		mg/kg		mg/kg	
Report as:	dry weight		dry weight		dry weight		dry weight	
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.290	0.00870	0.125	0.00872	0.168	0.00864	0.0865	0.00868

Method Mercury by SW7471A

Test Code HGCSSA00

Project Sample ID:	REL-COAL 33		SARM 20					
Lab ID:	9911510-09B		9911510-10B					
File ID:	Z4122814-36		Z4122814-37					
Date Collected:	11/16/99							
Date Prepared:	12/28/99		12/28/99					
Date Analyzed:	12/28/99 16:13:52		12/28/99 16:16:35					
Dilution Factor:	2		2					
Matrix:	Solid		Solid					
Units:	mg/kg		mg/kg					
Report as:	dry weight		dry weight					
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Mercury	0.119	0.00873	0.139	0.00630				

12/29/99 13:14:01

INITIAL CALIBRATION

Work Order # 9911510

Page 9

Initial Calibration # Z4991228142900

Calibration Date 12/28/99 14:29:00

Sol'n #

Method Mercury by SW-846

Test Code HGCSWA00

Instrument Z4

Analyst RWG

Reviewer MOS

Analytes	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Response Area Counts Reference Conc. mg/L	Correlation Coefficient
Mercury	0.000 0	0.0034959 0.0005	0.0147730 0.002	0.0289388 0.004	0.0701877 0.010	0.1406292 0.020	0.0075570 0.001	1.000

Specification Limits for correlation coefficient >0.995

DIGESTION BATCH SUMMARY

Digestion Batch # GDIG991227063000

Work Order # 9911510

Method Parr bomb ashing

Test Code PARRML00

Extraction Start Date/Time 12/27/99 06:30:00

Extraction Stop Date/Time

Analyst HD

Reviewer PRS

Sample	Project Sample ID	Lab Sample ID	Sample Size g	Cleanup Method
1	REL-COAL 11	9911510-01A	1.0002	
2	REL-COAL 12	9911510-02A	1.0003	
3	REL-COAL 13	9911510-03A	0.9999	
4	REL-COAL 21	9911510-04A	0.9999	
5	REL-COAL 22	9911510-05A	1.0000	
6	REL-COAL 23	9911510-06A	1.0000	
7	REL-COAL 31	9911510-07A	1.0001	
8	REL-COAL 32	9911510-08A	0.9999	
9	REL-COAL 33	9911510-09A	1.0001	
10	SARM 20	9911510-10A	0.9999	
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Quality Control	Project Sample ID	Lab Sample ID	Sample Size g	Cleanup Method
Blank		BLK993661	---	
Laboratory Control Sample		LCS995793	---	
Laboratory Control Sample Duplicate		LCSD995793	---	
Matrix Spike	REL-COAL 11	9911510-11A	1.0001	
Matrix Spike Duplicate	REL-COAL 11	9911510-11A	1.0001	

ANALYSIS BATCH SUMMARY

Analysis Batch # AAZ4 91228142901

Work Order # 9911510

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991228142900
Calibration Date 12/28/99

Analysis Start Date/Time 12/28/99 14:29:00
Analysis Stop Date/Time 12/28/99 16:22:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1	12/28/99 14:30:35		S_0	Initial Calibration Blank	Z4122814-1
2	12/28/99 14:33:15		S_05	Initial Calibration Standard 1	Z4122814-2
3	12/28/99 14:35:55		S_1	Initial Calibration Standard 2	Z4122814-3
4	12/28/99 14:38:37		S_2	Initial Calibration Standard 3	Z4122814-4
5	12/28/99 14:41:20		S_4	Initial Calibration Standard 4	Z4122814-5
6	12/28/99 14:44:03		S_10	Initial Calibration Standard 5	Z4122814-6
7	12/28/99 14:46:47		S_20	Initial Calibration Standard 6	Z4122814-7
8	12/28/99 14:51:01		S_1	Initial Calibration Standard 2	Z4122814-8
16	12/28/99 15:20:26		ICV	Initial Calibration Verification	Z4122814-16
17	12/28/99 15:23:07		ICB	Blank, Initial Calibration	Z4122814-17
18	12/28/99 15:25:46		BLK993661	Blank, Method	Z4122814-18
19	12/28/99 15:28:24		BLK993662	Blank, Method	Z4122814-19
20	12/28/99 15:31:03		LCS995793	Lab Control Sample	Z4122814-20
21	12/28/99 15:33:44		LCSD995793	Lab Control Sample Duplicate	Z4122814-21
22	12/28/99 15:36:25		LCS995794	Lab Control Sample	Z4122814-22
23	12/28/99 15:39:08		LCSD995794	Lab Control Sample Duplicate	Z4122814-23
24	12/28/99 15:41:51	REL-COAL 11	9911510-01B	Sample	Z4122814-24
25	12/28/99 15:44:35	REL-COAL 11	9911510-01B	Serial Dilutions	Z4122814-25
26	12/28/99 15:47:17	REL-COAL 11	9911510-01B	Analytical Spike	Z4122814-26
27	12/28/99 15:49:55	REL-COAL 11	9911510-11A	Matrix Spike	Z4122814-27
28	12/28/99 15:52:33	REL-COAL 11	9911510-12A	Matrix Spike Duplicate	Z4122814-28
29	12/28/99 15:55:11	REL-COAL 12	9911510-02B	Sample	Z4122814-29
30	12/28/99 15:57:50	REL-COAL 13	9911510-03B	Sample	Z4122814-30
31	12/28/99 16:00:31	REL-COAL 21	9911510-04B	Sample	Z4122814-31
32	12/28/99 16:03:10	REL-COAL 22	9911510-05B	Sample	Z4122814-32
33	12/28/99 16:05:51	REL-COAL 23	9911510-06B	Sample	Z4122814-33
34	12/28/99 16:08:31	REL-COAL 31	9911510-07B	Sample	Z4122814-34
35	12/28/99 16:11:11	REL-COAL 32	9911510-08B	Sample	Z4122814-35
36	12/28/99 16:13:52	REL-COAL 33	9911510-09B	Sample	Z4122814-36
37	12/28/99 16:16:35	SARM 20	9911510-10B	Sample	Z4122814-37

ANALYSIS BATCH SUMMARY (cont'd)

Analysis Batch # AAZ4 91228142901

Method Mercury by SW-846
Test Code HGCSWA00
Initial Calibration # Z4991228142900
Calibration Date 12/28/99

Analysis Start Date/Time 12/28/99 14:29:00
Analysis Stop Date/Time 12/28/99 16:22:00

Instrument Z4
Analyst RWG
Reviewer MOS

Sequence/Analysis Time	Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
38 12/28/99 16:19:18		CCV	Continuing Calibration Verification	Z4122814-38
39 12/28/99 16:22:00		CCB	Blank, Continuing Calibration	Z4122814-39

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 11
Lab Sample ID 9911510-01B
File # Z4122814-24
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:41:51

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.48

Aliquot Mass/Volume 1.0002 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.102	0.00863	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 12
Lab Sample ID 9911510-02B
File # Z4122814-29
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:55:11

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.98

Aliquot Mass/Volume 1.0003 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.122	0.00869	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 13
Lab Sample ID 9911510-03B
File # Z4122814-30
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:57:50

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.36

Aliquot Mass/Volume 0.9999 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.140	0.00862	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 21
Lab Sample ID 9911510-04B
File # Z4122814-31
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:00:31

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.80

Aliquot Mass/Volume 0.9999 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.0979	0.00867	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 22
Lab Sample ID 9911510-05B
File # Z4122814-32
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:03:10

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 31.00

Aliquot Mass/Volume 1.0000 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.290	0.00870	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 23
Lab Sample ID 9911510-06B
File # Z4122814-33
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:05:51

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 31.21

Aliquot Mass/Volume 1.0000 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.125	0.00872	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 31
Lab Sample ID 9911510-07B
File # Z4122814-34
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:08:31

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.56

Aliquot Mass/Volume 1.0001 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.168	0.00864	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 32
Lab Sample ID 9911510-08B
File # Z4122814-35
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:11:11

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.91

Aliquot Mass/Volume 0.9999 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.0865	0.00868	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID REL-COAL 33
Lab Sample ID 9911510-09B
File # Z4122814-36
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:13:52

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 31.30

Aliquot Mass/Volume 1.0001 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.119	0.00873	-1000

RESULTS

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Project Sample ID SARM 20
Lab Sample ID 9911510-10B
File # Z4122814-37
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 16:16:35

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 4.84

Aliquot Mass/Volume 0.9999 (g)
Extract/Digestate Volume 100 (mL)
Dilution Factor 2

Analyte	CAS #	Measured Concentration mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	7439-97-6	0.139	0.00630	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991228100000
Analysis Batch # AAZ4 91228142901

Lab Sample ID CCB
File # Z4122814-39
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/28/99
Date Analyzed 12/28/99 16:22:00

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000047 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991228100000
Analysis Batch # AAZ4 91228142901

Lab Sample ID ICB
File # Z4122814-17
Method Mercury by SW7470A
Test Code HGCSWA00

Date Prepared 12/28/99
Date Analyzed 12/28/99 15:23:07

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix W

Analyte	Aliquot Mass/Volume 50 (mL) Extract/Digestate Volume 50 (mL) Dilution Factor 1 — Measured Conc. mg/L	Detection Limit mg/L	Reporting Limit mg/L
Mercury	-0.000054 J	0.000030	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Lab Sample ID BLK993661
File # Z4122814-18
Method Mercury by SW7471A
Test Code HGCSSA00

Date Prepared 12/28/99
Date Analyzed 12/28/99 15:25:46

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S

Analyte	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 2 Measured Conc. mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	-0.0116 J	0.00600	-1000

LABORATORY BLANK INFORMATION

Digestion Batch # GDIG991228101000
Analysis Batch # AAZ4 91228142901

Lab Sample ID BLK993662
File # Z4122814-19
Method Mercury by SW7471A
Test Code HGCSSA00

Date Prepared 12/28/99
Date Analyzed 12/28/99 15:28:24

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S

Analyte	Aliquot Mass/Volume 1 (g) Extract/Digestate Volume 100 (mL) Dilution Factor 1 Measured Conc. mg/kg	Detection Limit mg/kg	Reporting Limit mg/kg
Mercury	-0.00460 J	0.00300	-1000

LABORATORY CONTROL SAMPLE

Digestion Batch # GDIG991227063000

Analysis Batch # AAZ4 91228142901

Work Order # 9911510

Method Mercury by SW7470A
Test Code HGCSWA00
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:33:44
Instrument Z4
Column
Analyst RWG
Reviewer MOS
Reporting Subset
Spikes Subset
Specs Subset
Matrix W
Report As received
% Moisture
Aliquot Mass or Vol 100 (mL)
Extract Mass or Vol 100 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995793 File ID Z4122814-20			LCS Duplicate Lab Sample ID LCSD995793 File ID Z4122814-21			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.00500	0.00462	92	0.00500	0.00447	89	82	123	3.3	13

12/29/99 13:14:01

LABORATORY CONTROL SAMPLE

Digestion Batch # GDIG991228101000

Analysis Batch # AAZ4 91228142901

Work Order # 9911510

Method Mercury by SW7470A

Test Code HGCSWA00

Date Prepared 12/28/99

Date Analyzed 12/28/99 15:39:08

Instrument Z4

Column

Analyst RWG

Reviewer MOS

Reporting Subset

Spikes Subset

Specs Subset

Matrix W

Report As received

% Moisture

Aliquot Mass or Vol 50 (mL)

Extract Mass or Vol 50 (mL)

Control Std. #	Vol. Added	Surrogate Sol'n #	Vol. Added

Analyte	LCS Lab Sample ID LCS995794 File ID Z4122814-22			LCS Duplicate Lab Sample ID LCSD995794 File ID Z4122814-23			Recovery Spec. Limits		RPD	
	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Spiked Conc. mg/L	Measured Conc. mg/L	Rec. %	Low %	High %	Result %	Spec. Limit %
Mercury	0.0100	0.00987	99	0.0100	0.0100	100	82	123	1.0	13

MATRIX SPIKE(S)

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Work Order # 9911510

Project Sample ID REL-COAL 11
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:52:33

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.48

Spike Sol'n #	Vol. Added	Sample Lab Sample ID 9911510-01B File # Z4122814-24 Aliquot Mass/Vol 1.0002 (g) Extract Mass/Vol 100 (mL) Dil Fact. 2	Spiked Sample Lab Sample ID 9911510-11A MS File # Z4122814-27 Aliquot Mass/Vol 1.0001 (g) Extract Mass/Vol 100 (mL) Dil Fact. 2			Spiked Sample Dup Lab Sample ID 9911510-12A MSD File # Z4122814-28 Aliquot Mass/Vol 0.9999 (g) Extract Mass/Vol 100 (mL) Dil Fact. 2			Recovery Specification Limits		RPD	
Surrogate Sol'n	Vol. Added											
Analyte	Spike Sol'n Conc. mg/L	Measured Conc. mg/kg	Spiked Conc. mg/kg	Measured Conc. mg/kg	Rec. %	Spiked Conc. mg/kg	Measured Conc. mg/kg	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	0.001	0.102	0.144	0.234	92	0.144	0.242	98	70	130	6.3	25

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91228142901
Initial Calibration # Z4991228142900

Lab Sample ID CCV
File # Z4122814-38
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/28/99 16:19:18

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.0100	0.0100	100	90	110

CONTINUING (OR DAILY) CALIBRATION VERIFICATION

Analysis Batch # AAZ4 91228142901
Initial Calibration # Z4991228142900

Lab Sample ID ICV
File # Z4122814-16
Method Mercury by SW7470A
Test Code HGCSWA00

Date Analyzed 12/28/99 15:20:26

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Instrument Z4
Analyst RWG
Reviewer MOS

Analyte	Measured Concentration mg/L	Reference Concentration mg/L	Recovery %	Recovery Specification Limits	
				Low %	High %
Mercury	0.00984	0.0100	98	90	110

ANALYTICAL SPIKE(S)

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Work Order # 9911510

Project Sample ID REL-COAL 11
Method Mercury by SW7471A
Test Code HGCSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared 12/28/99
Date Analyzed 12/28/99 15:47:17

Instrument Z4
Column
Analyst RWG
Reviewer MOS

Reporting Subset
Spikes Subset
Specs Subset

Matrix S
Report As dry weight
% Moisture 30.48

Spike Sol'n #	Vol. Added	Sample	Spiked Sample	Spiked Sample Dup	Recovery Specification Limits	RPD
		Lab Sample ID 9911510-01B	Lab Sample ID 9911510-01B	Lab Sample ID		
		File # Z4122814-24	File # Z4122814-26	File #		
Surrogate Sol'n	Vol. Added	Aliquot Mass/Vol 1.0002 (g)	Aliquot Mass/Vol 1.0002 (g)	Aliquot Mass/Vol		
		Extract Mass/Vol 100 (mL)	Extract Mass/Vol 100 (mL)	Extract Mass/Vol		
		Dil Fact. 2	Dil Fact. 2.222	Dil Fact.		

Analyte	Spike Sol'n Conc. mg/L	Measured Conc. mg/kg	Spiked Conc. mg/kg	Measured Conc. mg/kg	Rec. %	Spiked Conc.	Measured Conc.	Rec. %	Low %	High %	Result %	Specification Limit %
Mercury	0.002	0.102	0.639	0.816	112				85	115		

12/29/99 13:14:01

SERIAL DILUTION CHECK

Digestion Batch # GDIG991227063000
Analysis Batch # AAZ4 91228142901

Work Order # 9911510
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Project Sample ID REL-COAL 11
Method Mercury by SW7471A
Test Code HGCSSA00

Date Prepared 12/28/99
Date Analyzed 12/28/99 15:44:35

Instrument Z4
Analyst RWG
Reviewer MOS

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As dry weight

	Sample Result Lab Sample ID 9911510-01B Dilution Factor 2		Diluted Sample Result Lab Sample ID 9911510-01B Dilution Factor 10		% Difference	
Analyte	Measured Concentration mg/kg	Detection Limit mg/kg	Measured Concentration mg/kg	Detection Limit mg/kg	Result	Specification Limit %
Mercury	0.102	0.00863	-0.0245 J	0.0432	0	10

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Mercury by SW-846 Specification# HGCS

Lab Sample ID File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

RADIAN ANALYTICAL SERVICES

Work Order # 9911509

FPAS REPORT

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Client RELIANT ENERGY

Facility HL&P LIMESTONE STATION

Client Code RELIANT HG

Certified By [signature]

Date 12-3-99

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12/02/99 16:54:25

WORK ORDER SUMMARY

Report RADIAN INTERNATIONAL LLC
To P.O.BOX 201088
AUSTIN, TX 78720-1088
Attention GENE YOUNGERMAN

Client Code RELIANT HG
Client RELIANT ENERGY
Facility HL&P LIMESTONE STATION
Work ID EPA Hg ICR

Work Order # 9911509
Page 1

RCN 803310.01

Prepared STL-Austin
By 14046 Summit Drive
Bldg. B
Austin, TX 78720-1088

CSC DPMAXWELL

Case # NA
SDG # NA
RAS # 91002ADPM

New York ELAP ID #: 10915

Project Sample ID/ Description	Lab Sample ID	Test Code(s)	Method Desciption
REL-COAL 11	01A	MSRSSA00	Percent Moisture SW846
REL-COAL 12	02A	MSRSSA00	Percent Moisture SW846
REL-COAL 13	03A	MSRSSA00	Percent Moisture SW846
REL-COAL 21	04A	MSRSSA00	Percent Moisture SW846
REL-COAL 22	05A	MSRSSA00	Percent Moisture SW846
REL-COAL 23	06A	MSRSSA00	Percent Moisture SW846
REL-COAL 31	07A	MSRSSA00	Percent Moisture SW846
REL-COAL 32	08A	MSRSSA00	Percent Moisture SW846
REL-COAL 33	09A	MSRSSA00	Percent Moisture SW846
SARM 20	10A	MSRSSA00	Percent Moisture SW846

STATE CERTIFICATIONS

State	Agency	Certification ID
Arkansas	Department of Pollution Control and Ecology	
California	California Environmental Laboratory Accreditation Program	2257
Kansas	Kansas Department of Health and Environment	E-10165
Louisiana	Louisiana Department of Health and Hospitals	LA 97-29
North Carolina	Department of Environment, Health and Natural Resources	302
New Jersey	New Jersey Department of Environmental Protection	82005
New York	New York State Department of Health	10915
Oklahoma	Oklahoma Water Resources Board	8720
South Carolina	Department of Health and Environmental Control	82003001
Utah	Utah Department of Health	RADC
Wisconsin	Wisconsin Department of Natural Resources	99885260

FLAG DEFINITIONS

Flag	Definition
< DL	Result less than stated Detection Limit and greater than or equal to zero.
NA	Analyte concentration not available for this analysis.
NC	RPD and/or % Recovery not calculated. See Narrative for explanation.
ND	Not detected. No instrument response for analyte or result less than zero.
NR	Not reported. Result greater than or equal to stated Detection Limit and less than specified Reporting Limit.
NS	Analyte not spiked.
A	Presence of hydrocarbon mix eluting in the Lube Oil range. The pattern does not match that of Lube Oil.
B	Analyte detected in method blank at concentration greater than the Reporting Limit (and greater than zero).
C	Confirming data obtained using second GC column or GCMS.
D	Presence of hydrocarbon mix eluting in the Diesel range. The pattern does not match that of Diesel.
E	Analyte concentration exceeded calibration range.
F	Interference or coelution suspected. See Narrative for explanation.
G	Presence of hydrocarbon mix eluting in the Jet Fuel range. The pattern does not match that of Jet Fuel.
H	Presence of analyte previously confirmed by historical data.
I	Analyte identification suspect. See Narrative for explanation.
J	Result is less than stated Detection Limit but greater than or equal to specified Reporting Limit.
K	Peak did not meet method identification criteria. Analyte not detected on other GC column.
M	Result modified from previous Report. See Narrative for explanation.
P	Analyte not confirmed. Results from primary and secondary GC columns differ by greater than a factor of 3.
Q	QC result does not meet tolerance in Protocol Specification.
R	Result reported elsewhere.
S	Analyte concentration obtained using Method of Standard Additions (MSA).
T	Second column confirmational analysis not performed.
X	See Narrative for explanation.
Y	See Narrative for explanation.
Z	See Narrative for explanation.

ANALYTICAL PROTOCOL SUMMARY

Work Order # 9911509

Client RELIANT ENERGY

Facility HL&P LIMESTONE STATION

Client Code RELIANT HG

Method Percent moisture, SW846

Project Sample ID/Description	Lab Sample ID	Test Code(s)	Extraction/Digestion Batch #	Analysis Batch #
REL-COAL 11	9911509-01A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 12	9911509-02A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 13	9911509-03A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 13	9911509-03A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 21	9911509-04A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 22	9911509-05A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 23	9911509-06A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 31	9911509-07A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 32	9911509-08A	MSRSSA00	NA	EXMSRS91202111001
REL-COAL 33	9911509-09A	MSRSSA00	NA	EXMSRS91202111001
SARM 20	9911509-10A	MSRSSA00	NA	EXMSRS91202111001

RESULTS SUMMARY

Method Percent moisture, SW846
Test Code MSRSSA00

Project Sample ID:	REL-COAL 11		REL-COAL 12		REL-COAL 13		REL-COAL 13	
Lab ID:	9911509-01A		9911509-02A		9911509-03A		9911509-03A	
File ID:	MSRS120211-1		MSRS120211-2		MSRS120211-3		MSRS120211-11	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:								
Date Analyzed:	12/02/99 11:10		12/02/99 11:10		12/02/99 11:10		12/02/99 11:10:00	
Dilution Factor:	1		1		1		1	
Matrix:	Solid		Solid		Solid		Solid	
Units:	%		%		%		%	
Report as:								
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Percent moisture	30.5		31.0		30.4		30.5	

Method Percent moisture, SW846

Test Code MSRSSA00

Project Sample ID:	REL-COAL 21		REL-COAL 22		REL-COAL 23		REL-COAL 31	
Lab ID:	9911509-04A		9911509-05A		9911509-06A		9911509-07A	
File ID:	MSRS120211-4		MSRS120211-5		MSRS120211-6		MSRS120211-7	
Date Collected:	11/16/99		11/16/99		11/16/99		11/16/99	
Date Prepared:								
Date Analyzed:	12/02/99 11:10		12/02/99 11:10		12/02/99 11:10		12/02/99 11:10	
Dilution Factor:	1		1		1		1	
Matrix:	Solid		Solid		Solid		Solid	
Units:	%		%		%		%	
Report as:								
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Percent moisture	30.8		31.0		31.2		30.6	

RESULTS SUMMARY (Cont'd)

Method Percent moisture, SW846
Test Code MSRSSA00

Project Sample ID:	REL-COAL 32		REL-COAL 33		SARM 20			
Lab ID:	9911509-08A		9911509-09A		9911509-10A			
File ID:	MSRS120211-8		MSRS120211-9		MSRS120211-10			
Date Collected:	11/16/99		11/16/99					
Date Prepared:								
Date Analyzed:	12/02/99 11:10		12/02/99 11:10		12/02/99 11:10			
Dilution Factor:	1		1		1			
Matrix:	Solid		Solid		Solid			
Units:	%		%		%			
Report as:								
Column:								
Analyte	Conc.	DL	Conc.	DL	Conc.	DL	Conc.	DL
Percent moisture	30.9		31.3		4.84			

ANALYSIS BATCH SUMMARY

Analysis Batch # EXMSRS91202111001

Method Percent moisture, SW846
Test Code MSRSSA00
Initial Calibration # NA
Calibration Date NA

Analysis Start Date/Time 12/02/99 11:10:00
Analysis Stop Date/Time 12/02/99 13:16:00

Instrument MSRS
Analyst HLH
Reviewer

Sequence/Analysis Time		Project Sample ID	Lab Sample ID	Sample Type	Analysis File #
1	12/02/99 11:10	REL-COAL 11	9911509-01A	Sample	MSRS120211-1
2	12/02/99 11:10	REL-COAL 12	9911509-02A	Sample	MSRS120211-2
3	12/02/99 11:10	REL-COAL 13	9911509-03A	Sample	MSRS120211-3
4	12/02/99 11:10	REL-COAL 21	9911509-04A	Sample	MSRS120211-4
5	12/02/99 11:10	REL-COAL 22	9911509-05A	Sample	MSRS120211-5
6	12/02/99 11:10	REL-COAL 23	9911509-06A	Sample	MSRS120211-6
7	12/02/99 11:10	REL-COAL 31	9911509-07A	Sample	MSRS120211-7
8	12/02/99 11:10	REL-COAL 32	9911509-08A	Sample	MSRS120211-8
9	12/02/99 11:10	REL-COAL 33	9911509-09A	Sample	MSRS120211-9
10	12/02/99 11:10	SARM 20	9911509-10A	Sample	MSRS120211-10
11	12/02/99 11:10:00	REL-COAL 13	9911509-03A	Sample Duplicate	MSRS120211-11

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 11
Lab Sample ID 9911509-01A
File # MSRS120211-1
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.5		

RESULTS

Extraction Batch # _____
Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 12
Lab Sample ID 9911509-02A
File # MSRS120211-2
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	31.0		

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 13
Lab Sample ID 9911509-03A
File # MSRS120211-3
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.4		

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 21
Lab Sample ID 9911509-04A
File # MSRS120211-4
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.8		

RESULTS

Extraction Batch # _____
Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 22
Lab Sample ID 9911509-05A
File # MSRS120211-5
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	31.0		

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 23
Lab Sample ID 9911509-06A
File # MSRS120211-6
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 — Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	31.2		

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 31
Lab Sample ID 9911509-07A
File # MSRS120211-7
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.6		

RESULTS

Extraction Batch # _____
Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 32
Lab Sample ID 9911509-08A
File # MSRS120211-8
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.9		

RESULTS

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 33
Lab Sample ID 9911509-09A
File # MSRS120211-9
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	31.3		

RESULTS

Extraction Batch # _____
Analysis Batch # EXMSRS91202111001

Project Sample ID SARM 20
Lab Sample ID 9911509-10A
File # MSRS120211-10
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected _____
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume _____ (mL) Dilution Factor 1 Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	4.84		

RESULTS

Extraction Batch # _____
Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 13
Lab Sample ID 9911509-03A
File # MSRS120211-11
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10:00

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As NA
% Moisture NA

Analyte	CAS #	Aliquot Mass/Volume _____ (g) Extract/Digestate Volume 1 (mL) Dilution Factor 1 — Measured Concentration %	Detection Limit	Reporting Limit
Percent moisture	NO_CAS	30.5		

SAMPLE DUPLICATES

Extraction Batch # _____

Analysis Batch # EXMSRS91202111001

Project Sample ID REL-COAL 13
Method Percent moisture, SW846
Test Code MSRSSA00

Date Collected 11/16/99
Date Received 11/23/99
Date Prepared _____
Date Analyzed 12/02/99 11:10:00

Instrument MSRS
Column _____
Analyst HLH
Reviewer KAH

Reporting Subset ___
Spikes Subset ___
Specs Subset ___

Matrix S
Report As _____

	Sample Lab Sample ID 9911509-03A Dil Fact. 1	Duplicate Lab Sample ID 9911509-03A Dil Fact. 1	RPD	
Analyte	Measured Conc. %	Measured Conc. %	Result	Specification Limit %
Percent moisture	30.4	30.5	0.49	20

ANALYTICAL PROTOCOL SUMMARY
COMMENTS/NARRATIVE

Method Percent moisture, SW846 Specification# MSRS D

Lab Sample ID File ID	Project Sample ID/Description	Analyte	Flag	Comment/Narrative	Corrective Action

CHAIN-OF-CUSTODY ADDENDUM

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

ADDENDUM # 99- **1987**

RECEIVED BY: Jean Serokang

DATE RECEIVED: 11/23/99

UNPACKED DATE: 11/23/99

CLIENT CODE: RELIANT-HG

VOC SAMPLES SEE SECTION 1.0, 2.0 & 6.0 ☐ YES

Number of Shipping Containers Received with Chain of Custody 1

Work Order(s)		
9911509		
510		
~~511~~ 7212/1/99		

1.0 CONTAINERS EXAMINED UPON RECEIPT BY: JL2

Container Sealed: ☐ YES ☑ NO

Custody Seal Number Present: ☐ YES ☑ NO

Container Seal Present: ☐ YES ☑ NO

Custody Seal Signed/Dated: ☐ YES ☑ NO

If seal not intact, list air bill number of that container(s): hand delivered

2.0 VOC CANISTERS EXAMINED UPON RECEIPT _____

Canister Valves Closed: ☐ YES ☐ NO

Samples Received Match Chain: ☐ YES ☐ NO

Canister Valves Capped: ☐ YES ☐ NO

See additional comments: ☐ YES ☐ NO

Packing Material Used: _____

Comments: _____

3.0 SAMPLE TEMPERATURE UPON RECEIPT: JL2 PYROMETER#: NA

The temperature of the container(s) is: Ambient *(acceptable tolerance 2-6°C)*

If temperature is outside acceptable tolerance, Client Services was notified (_____CSC) list all IDs below.

Samples received do not require cooling _____

OK to analyze samples: ☑ YES ☐ NO

PRESERVATION OF SAMPLES REQUIRED: ☑ NA ☐ YES **VERIFIED BY:** JL2

Base samples are>pH 12: ☐ YES ☐ NO

Acid preserved are<pH 2: ☐ YES ☐ NO

Cyanide samples checked for sulfides: ☐ YES

Sulfide samples appear to be preserved with zinc acetate: ☐ YES ☐ NO

Samples checked for chlorine per specification: ☐ YES

Free chlorine present: ☐ YES ☐ NO

If sample preservation/temperature (°C) is outside acceptable tolerance, Client Services was notified (_____CSC) list all ID's below.

Field Sample ID	Analysis	pH/Temp

Field Sample ID	Analysis	PH/Temp

12/6/1999 4:13 PM

Workorder # 9911505

Client Code RELIANT HG

Approved By MH

Date 12/7/99

Source Filter Weighing Report

Sample ID	Workorder #	Filter ID	*Filter Wt 1 (g)*	*Filter Wt 2 (g)*	Avg Filter Wt (g)	Tare Wt (g)	NET Wt (g)
REL-1101	9911505-01A	Q-0143	0.3558	0.3562	0.3560	0.3448	**0.0112**
REL-1201	9911505-02A	Q-0142	0.3678	0.3680	0.3679	0.3598	**0.0081**
REL-1301	9911505-03A	Q-0117	0.3899	0.3899	0.3899	0.3682	**0.0217**
REL-1401	9911505-04A	Q-0109	0.4141	0.4143	0.4142	0.4155	**-0.0013**
REL-1151	9911505-05A	Q-0145	0.3726	0.3730	0.3728	0.3471	**0.0257**
REL-1251	9911505-06A	Q-0116	0.3956	0.3956	0.3956	0.3740	**0.0216**
REL-1351	9911505-07A	Q-0141	0.4199	0.4203	0.4201	0.3513	**0.0688**
REL-1451	9911505-08A	Q-0144	0.3557	0.3559	0.3558	0.3561	**-0.0003**

Qcer # _____

Excel File Name 9911505A.xls

Comments _____

12/6/1999 4:22 PM

Workorder # 9911505

Client Code RELIAN HG

Approved By _____

Date _____

PNR Report

Sample ID	Workorder #	*PNR Wt 1 (g)*	*PNR Wt 2 (g)*	Avg PNR Wt (g)	*Tare Wt 1 (g)*	*Tare Wt 2 (g)*	Avg Tare Wt (g)	Residue Wt (g)
REL-1102	9911505-09A	103.8575	103.8777	103.8676	103.8504	103.8502	103.8503	**0.0173**
REL-1202	9911505-10A	99.8316	99.8314	99.8315	99.8258	99.8259	99.8259	**0.0057**
REL-1302	9911505-11A	93.8447	93.8449	93.8448	93.8345	93.8345	93.8345	**0.0103**
REL-1402	9911505-12A	95.5347	95.5347	95.5347	95.5311	95.5311	95.5311	**0.0036**
REL-1152	9911505-13A	105.1892	105.1892	105.1892	105.1837	105.1839	105.1838	**0.0054**
REL-1252	9911505-14A	100.2778	100.2776	100.2777	100.2687	100.2689	100.2688	**0.0089**
REL-1352	9911505-15A	107.7814	107.7810	107.7812	107.7662	107.7666	107.7664	**0.0148**
REL-1452	9911505-16A	103.1688	103.1692	103.1690	103.1611	103.1613	103.1612	**0.0078**

Qcer # _____

Excel File Name 9911505B.xls

Comments _____

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

Laboratory STL-Ans

Chain of Custody Record

Page 1 of 1

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911533

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-FILTERFB	FILTER	11/17/99		1		HOLD
REL-ACET FB	ACETONE			1		
REL-HNO3 FB	HNO_3 (0.1 N)			1		
REL-NITRIC FB	HNO_3 (10%)			1		
REL-HYDROX FB	HYDROXYLAMINE (10%)			1		
REL-KCL FB	KCl (1.0 N)			1		
REL-NITPERFB	HNO_3 / H_2O_2 (5% & 10%)			1		
REL-PERM FB	$KMnO_4$ / H_2SO_4 (4% & 10%)			1		
REL-KMNO4FB	$KMnO_4$ (5%)			1		

REMARKS

Attention:

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	1600

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Karen Bexchang	11/19/99	1630							

REMARKS: addendum 99-1981

lm1ic:/fh/30337coc_pg3.fh7

4.0 CONDITION OF BOTTLES/CONTAINERS

VERIFIED BY: JL 2

Samples received match COC: ☐ YES ☑ NO

Bottles received intact: ☑ YES ☐ NO

See additional discrepancies/comments section: ☑ YES ☐ NO

Samples received from USDA restricted area: ☐ YES ☑ NO

VOA trip blanks included: ☐ YES ☐ NO ☑ N/A

5.0 ADDITIONAL DISCREPANCIES

Appears on COC			Appears on Label			
Sample ID	Date/Time	Analysis	Sample ID	Date/Time	Analysis	Comments
REL-1401	11/16/99	Train	same	11/17/99	same	10g per bottles label per PPM
to REL-1406						
REL-1451	11/16/99	train	same	11/17/99	same	
to REL-1456						

6.0 SHIPPING DOCUMENTATION

Freight bill is available and attached to COC: ☐ YES ☑ NO Carrier: hand delivered by John LaPierre

Freight bill numbers:

7.0 OTHER COMMENTS:

Client COC is signed, dated with time of receipt, and addendum number is noted in the comments section.

Chain-of-Custody Addendum Verified By: S. Maxwell Date: 11/29/99

RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911505-508

ANALYSES: BOA/Res Surv 11/17/99

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS												REMARKS
REL-1451	FILTER	11/16/99		1	✓											(FLD-IN FB)
REL-1452	HNO3			1	✓											
REL-1453	KI + Acetone			1	✓											
REL-1454	KI			1	✓											
REL-1455	HNO3/H2O2			1	✓											
REL-1456	KMnO4/H2SO4			1	✓											

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	1600

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP °C	SEAL #	CONDITION
[signature]	11/19/99	1930							

REMARKS: addendum 99-1987

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A 1

RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-1351	FILTER	11/16/99		1	✓	(FGD-IN RUN 3)
REL-1352	HNO_3			1	✓	
REL-1353	Acetone			1	✓	
REL-1354	~~HNO_3~~ / KCl			1	✓	
REL-1355	HNO_3 / H_2O_2			1	✓	
REL-1356	$KMnO_4$ / H_2SO_4			1	✓	

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	16..

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Karen Gustafson	11/19/99	1032							

REMARKS: addendum 99-1981

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RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant.

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-1251	FILTER	11/16/99		1	✓	(FCD-IN RUN 2)
REL-1252	Acetone			1	✓	
REL-1253	HNO_3			1	✓	
REL-1254	KCl			1	✓	
REL-1255	HNO_3/H_2O_2			1	✓	
REL-1256	$KMnO_4/H_2SO_4$			1	✓	

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	16

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Lauren Goodenough	11/19/99	16:30							

REMARKS: addendum 99-1981

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RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-1151	Filter	11/16/99		1		(FLD-IN DUN1)
REL-1152	Acetone			1		
REL-1153	HNO_3			1		
REL-1154	HCl			1		
REL-1155	HNO_3/H_2O_2			1		
REL-1156	Methanol/H_2O_2			1		

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	11:00

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Karen Guachong	11/19/99	1630							

REMARKS: addendum 99-1981

IEG-4\FH\3-96-30337 coc.FHE

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RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett TX

PREPARED BY (Signature):

all labels have 11/17/99

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL- ~~1451~~ 1401	Filter	11/16/99		1		(FGD OUT FB)
REL- ~~1452~~ 1402	Acetone			1		
REL- ~~1453~~ 1403	HNO_3			1		
REL- ~~1454~~ 1404	KCl			1		
REL- ~~1455~~, 1405	HNO_3/ H_2O_2			1		
REL- ~~1456~~ 1406	$CMnO_4$/ H_2SO_4			1		

REMARKS

RELINQUISHED BY:	DATE	TIME
	11/17/99	1600

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP °C	SEAL #	CONDITION
Dawn Geisehong	11/19/99	1630							

REMARKS: addendum 99-1981

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3

RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

ANALYSES

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	REMARKS
REL-1301	Filter	11/16/99		11	(FLD-OUT RUN 3)
REL-1302	Acetone			11	
REL-1303	HNO_3			11	
REL-1304	KCl			11	
REL-1305	HNO_3/H_2O_2			11	
REL-1306	$KMnO_4/H_2SO_4$			11	

REMARKS

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
									[signature]	11/19/99	16

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Leann Goodwing	11/19/99	1630							

REMARKS: addendum 99-185-1981 JRZ 11/19/99

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RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [signature]

9911505-508

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-1201	Filter	11/16/99		1		(PID-OUT KHN2)
REL-1202	Acetone	↓		1		↓
REL-1203	HNO_3			1		
REL-1204	KCl			1		
REL-1205	HNO_3/H_2O_2			1		
REL-1206	$KMnO_4/H_2SO_4$			1		

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	11/19/99	1600

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Eileen Gardberg	11/19/99	1630							

REMARKS: coldenvolum 99-1481

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RADIAN INTERNATIONAL LLC

Chain of Custody Record

PROJECT: Reliant

SITE: Jewett, TX

PREPARED BY (Signature): [illegible]

9911505-505

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES	REMARKS
REL-1101	Filter	11/16/99 1150		1	✓	(FLD-out RUN 1)
REL-1102	Acetone	↓		1	✓	
REL-1103	HNO_3			1	✓	
REL-1104	KCl			1	✓	contains KMnO4/H2SO4 as preser
REL-1105	HNO3/H2O2			1	✓	
REL-1106	Chemical/H2SO4			1	✓	↓

REMARKS

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
									[illegible]	11/17/99	16:[illegible]

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
Sam Gorlachenko	11/19/99	1630							

REMARKS: addendum 99-1981

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APPENDIX C

Raw Process Data

Unit 1 Process Data

Plant Name: LMS
General Average Report
Reporting Period: 11/16/99 to 11/16/99
Site Name: LMS1
Data Averaging Type: 1m
Time of Report: 11/17/99 8:48
Rolling Average Interval: 1

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
7:00	676.19	434.35	61.21	1.21E+08	166.43	955.98	189.67	3809.5	5.66	141.72
7:01	675.24	432.16	61.21	1.21E+08	164.46	970.5	189.19	3799.55	7.11	141.79
7:02	674.53	433.25	60.21	1.20E+08	166.35	963.59	188.69	3772.94	6.97	141.81
7:03	672.79	436.35	59.22	1.20E+08	177.65	963.22	184.16	3672.11	5.56	141.77
7:04	673.45	443.54	59.22	1.20E+08	185.17	957.43	181.99	3628.31	7.68	141.76
7:05	674.29	448.46	59.22	1.20E+08	189.04	957.95	182.56	3640.64	7.14	142.25
7:06	678.34	453.01	59.28	1.20E+08	190.11	957.56	183.29	3656.54	5.69	142.23
7:07	681.94	453.04	59.28	1.20E+08	189.13	962.36	188.46	3760.24	6.12	142.22
7:08	687	455.95	59.28	1.20E+08	193.41	966.25	189.52	3780.22	6.88	141.9
7:09	690.57	458.2	61.53	1.21E+08	197.07	966.28	190.73	3816.72	6.49	141.91
7:10	689.73	455.24	61.88	1.21E+08	195.34	972.38	192.16	3848.15	6.35	141.94
7:11	691.81	454.95	61.88	1.21E+08	195.85	973.18	191.06	3826.13	6.66	142.1
7:12	695.81	462.75	61.88	1.21E+08	198.91	969.57	190.79	3822.15	7.97	142.22
7:13	698.76	461.7	62.03	1.23E+08	202.14	961.72	188.86	3841.88	6.19	142.51
7:14	702.03	459.76	62.03	1.23E+08	205.91	955.17	188.69	3837.84	6.47	142.76
7:15	704.92	462.97	62.02	1.23E+08	204.77	955.29	194.23	3968.59	7.5	142.65
7:16	708.22	467.86	61.97	1.24E+08	201.75	967.19	198.17	4089.03	7.36	142.4
7:17	710.55	478.13	61.97	1.24E+08	204.08	974.53	197.24	4068.33	6.31	142.05
7:18	712.26	479.36	61.97	1.24E+08	208.17	966.26	192.79	3977.65	5.1	141.97
7:19	719.1	481.21	61.97	1.24E+08	210.06	965.86	192.19	3965.18	4.95	142.03
7:20	725.49	486.3	61.97	1.24E+08	212.99	963.48	190.66	3934.14	5.72	141.93
7:21	727.1	487.43	61.97	1.24E+08	210.97	950.35	190.79	3936.17	5.84	142.08
7:22	729.9	483.97	61.97	1.24E+08	210.25	949.26	190.66	3934.07	6.82	142.31
7:23	730.12	476.24	61.97	1.24E+08	209.63	950.26	192.13	3962.96	6.77	142.5
7:24	739.3	481.16	64.07	1.26E+08	208.86	949.44	192.09	4022.75	6.11	142.54
7:25	741.66	487.29	65.67	1.27E+08	208.52	949.05	191.89	4033.66	6.51	142.45
7:26	743.14	487.3	65.67	1.27E+08	207.71	953.71	190.33	4000.06	5.57	142.25
7:27	741.12	490.71	65.15	1.28E+08	208.9	958.89	190.83	4050.35	5.71	142.3
7:28	741.08	492.04	64.88	1.29E+08	205.58	964.12	198.54	4233.05	7.11	142.17
7:29	740.75	490.26	64.88	1.29E+08	206.5	975.07	197.04	4201.16	6.62	142.31
7:30	742.79	493.09	64.88	1.29E+08	208.54	971.72	195	4158.44	6.33	142.33
7:31	744.65	501.3	65.44	1.30E+08	206.81	964.92	197.3	4242.86	5.17	142.72
7:32	746.86	503.96	66.65	1.32E+08	204.96	975.19	198.74	4339.1	6.27	142.72
7:33	750.57	505.92	66.65	1.32E+08	208.23	983.22	195.9	4277.86	7.75	142.78

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
7:34	754.5	510.02	66.74	1.32E+08	209.44	976.53	194.49	4252.59	6.89	142.52
7:35	759.67	512.25	68.03	1.33E+08	206.87	980.5	197.94	4374.72	5.39	142.44
7:36	762.34	513.39	68.03	1.33E+08	205.88	985.22	195.97	4332.82	7.58	142.44
7:37	761.54	511.63	68.03	1.33E+08	206.52	990.67	196.1	4335	7.38	142.52
7:38	762.25	503.85	68.06	1.34E+08	206.96	987.48	196.87	4377.03	6.52	142.53
7:39	761.62	502.32	68.43	1.36E+08	204.66	984.67	200.87	4524.28	7	142.67
7:40	758.68	505.58	68.43	1.36E+08	202.45	990.67	200.63	4517.49	9.15	142.98
7:41	760.44	504.01	68.42	1.36E+08	203.71	987.2	196.63	4427.41	10.43	143.01
7:42	762.55	496.59	67.7	1.36E+08	205.05	987.62	196.87	4453.94	13.76	143.07
7:43	764.18	492.5	67.6	1.36E+08	206.28	994.82	199.67	4519.17	8.7	142.68
7:44	763.05	495.81	67.6	1.36E+08	202.63	1004.46	203.74	4609.65	15.81	142.56
7:45	760.94	503.16	66.73	1.36E+08	201.41	1011.28	203.54	4579.42	17.72	142.61
7:46	756.48	503.82	66.47	1.35E+08	204.83	1008.72	201.54	4527.92	9.51	142.61
7:47	755.99	509.9	66.47	1.35E+08	206.66	1007.7	203.3	4568.37	7.47	142.63
7:48	759.6	517.23	66.59	1.35E+08	207.17	1014.87	206.5	4638.46	7.88	142.74
7:49	758.07	511.46	67.51	1.35E+08	207.5	1019.67	205.03	4586.36	7.18	143.08
7:50	761.38	504.44	67.51	1.35E+08	209.37	1012.72	202.54	4530.36	7.17	143.2
7:51	765.69	503.43	67.51	1.35E+08	203.01	1015.4	212.5	4754.22	7.62	143.09
7:52	769	509.61	68.01	1.35E+08	204.27	1027.27	209.9	4709.85	7.96	142.79
7:53	768.28	520.78	68.27	1.35E+08	204.06	1021.54	208.9	4688.97	9.31	142.78
7:54	770.88	533.1	68.27	1.35E+08	204.25	1020.75	209.17	4695.78	7.48	142.84
7:55	774.43	547.98	68.27	1.35E+08	208.87	1014.86	208.24	4673.3	7.04	142.9
7:56	776.29	545.38	70.58	1.38E+08	210.12	1007.39	207.47	4765.09	6.53	142.96
7:57	779.25	528.68	71.43	1.38E+08	208.47	1006.27	210.87	4846.98	7.74	143.39
7:58	789.51	499.15	71.43	1.38E+08	207.05	1018.04	212.94	4892.98	9.58	143.5
7:59	789.33	497.49	71	1.39E+08	202.15	1023.23	213.3	4919.45	17.84	143.45
8:00	788.75	493.96	69.93	1.40E+08	199.23	1033.52	212.47	4938.22	30.34	143.18
8:01	788.62	497.33	69.93	1.40E+08	209.7	1044.54	207.94	4831.35	32.34	143.1
8:02	784.4	514.07	68.6	1.40E+08	215.5	1033.03	209	4844.64	14.84	143
8:03	780.12	533.93	67.26	1.39E+08	220.07	1044.9	215.33	4979.63	11.2	143.01
8:04	775	539.91	67.26	1.39E+08	227.83	1048.97	212.03	4903.3	8.83	143.26
8:05	776.72	534.03	68.59	1.39E+08	224.4	1042.62	217.2	5022.63	7.03	143.43
8:06	780.02	526.17	71.46	1.39E+08	226.6	1053.73	220.53	5097.22	5.37	143.55
8:07	781.53	517.84	71.46	1.39E+08	221.54	1049.72	217.93	5037.12	7.29	143.64
8:08	784.34	515.92	71.46	1.39E+08	218	1051.02	216.2	4994.23	6.9	143.65
8:09	782.92	518.66	69.1	1.39E+08	219.85	1045.17	210.17	4838.71	6.58	143.67
8:10	780.34	518.83	69.1	1.39E+08	221.99	1026.75	207.2	4769.65	6.66	143.73
8:11	778.43	523.34	69.1	1.39E+08	222.84	1024.37	209.2	4815.69	6.76	143.94
8:12	778.16	526.71	69.46	1.40E+08	222.52	1035.35	212.8	4930.53	5.93	144.07
8:13	778.95	527.73	69.62	1.40E+08	223.94	1042.56	214.66	4991.94	6.18	144.12
8:14	780.74	520.88	69.62	1.40E+08	222.17	1051.15	218.7	5084.8	8.26	144.09
8:15	781.3	516.94	69.79	1.40E+08	221.56	1062.85	217.13	5036.9	7.93	144.06

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
8:16	782.28	518.95	70.17	1.39E+08	220.56	1055.45	216.03	4990.29	5.49	144.11
8:17	786.15	530	70.17	1.39E+08	216.24	1049.72	217.27	5020.26	8.18	144.14
8:18	787.24	537.43	70.17	1.39E+08	216.79	1048.78	214.3	4951.02	6.88	144.14
8:19	787.31	540.29	70.17	1.39E+08	219.35	1041.27	212.24	4902.57	6.09	144.22
8:20	790.3	533.05	70.17	1.39E+08	219.37	1034.54	214.03	4944.23	7.03	144.32
8:21	791.01	525.48	70.17	1.39E+08	219.43	1035.48	215.7	4983.44	7.54	144.43
8:22	789.55	520.86	70.17	1.39E+08	217.9	1039.9	214.13	4946.54	7.28	144.5
8:23	789.52	519.26	70.17	1.39E+08	211.75	1043.77	216.03	4990.47	7.73	144.49
8:24	789.99	526.3	69.67	1.39E+08	215.71	1043.23	212.64	4911.96	7.38	144.54
8:25	788.86	532.31	69.38	1.39E+08	215.38	1036.08	211.93	4895.68	7.02	144.55
8:26	789.19	532.52	69.38	1.39E+08	215.14	1037.02	212.17	4902.75	6.41	144.61
8:27	789.47	531.74	69.69	1.39E+08	218.13	1034.99	214.57	4963.4	5.89	144.7
8:28	790.29	529.01	70.36	1.40E+08	216.29	1036.83	218.24	5060.1	6.61	144.77
8:29	789.32	524.93	70.36	1.40E+08	215.59	1037.03	216.13	5011.37	6.44	145.39
8:30	788.82	521.48	70.39	1.40E+08	214.41	1040.83	222.2	5155.85	6.68	145.53
8:31	788.09	523.26	70.6	1.40E+08	214.95	1049.52	221.93	5154.01	6.88	145.6
8:32	789.14	536.82	70.6	1.40E+08	214.97	1042.8	220.66	5126.21	6.22	145.26
8:33	784.63	537.73	70.6	1.40E+08	214.14	1045.32	220.76	5128.5	6	145.29
8:34	786.73	540.2	70.6	1.40E+08	216.12	1049.72	219.26	5093.55	7.52	145.28
8:35	789.88	539.05	69.64	1.40E+08	220.25	1052.49	218.83	5077.14	6.65	145.35
8:36	790.94	532.31	69.29	1.40E+08	219.33	1051.44	218.97	5081.23	8.7	145.48
8:37	792.15	527.34	69.29	1.40E+08	215.91	1056.8	221.42	5136.88	9.92	145.57
8:38	790.64	529.31	69.56	1.40E+08	214.52	1058.11	223.76	5186.55	10.32	146.01
8:39	788.61	531.8	69.96	1.39E+08	214.33	1058.14	221.68	5127.5	10.65	146.01
8:40	787.61	535.38	69.96	1.39E+08	215.36	1057.88	217.43	5027.98	8.93	145.9
8:41	788.91	538.62	69.98	1.39E+08	216.37	1053.18	217.15	5019.93	9.4	145.63
8:42	787.51	535.17	70.23	1.39E+08	220.12	1055.34	216.74	5001.32	7.37	145.8
8:43	785.86	529.94	70.23	1.39E+08	219.18	1050.26	218.27	5038.29	9.96	145.88
8:44	786.79	527.99	70.22	1.39E+08	217.47	1051.21	219.19	5060	10.02	145.93
8:45	782.98	523.31	70.02	1.39E+08	216.2	1050.91	217.03	5021.54	8.83	145.95
8:46	783.25	523.05	70.02	1.39E+08	216.09	1043.29	216.47	5009.9	7.99	146.09
8:47	782.12	533.21	70.02	1.39E+08	215.45	1046.51	217.54	5033.22	9.02	146.35
8:48	781.41	543.66	69.21	1.39E+08	217.5	1048.02	213.02	4911.86	8.28	146.43
8:49	781.61	543.8	69.13	1.39E+08	218.79	1040.22	211.69	4880.94	9.32	146.51
8:50	778.32	534.46	69.13	1.39E+08	215.19	1048.77	218.98	5049.24	6.82	146.5
8:51	780.23	537.3	69.13	1.39E+08	204.36	1069.6	222.34	5128.1	7.5	146.12
8:52	776.27	538.2	70.82	1.39E+08	198.36	1068.5	217.71	5035.21	6.46	146.16
8:53	779.8	543.16	70.97	1.39E+08	195.78	1052.39	210.57	4870.96	8.18	146.13
8:54	780.79	547.36	70.97	1.39E+08	195.1	1036.47	210.92	4877.89	6.15	146.18
8:55	782.02	543.04	70.71	1.40E+08	194.56	1034.36	210.21	4869.56	7.35	146.16
8:56	778.07	539.05	70.48	1.40E+08	193.63	1028.36	210.51	4878.95	7.85	146.62
8:57	774.4	529.56	70.48	1.40E+08	192.89	1033.4	213.66	4953.16	7.62	146.65

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
8:58	775.96	533.66	69.99	1.40E+08	189.82	1037.15	214.87	4979.4	7.84	146.64
8:59	783.53	551.38	69.07	1.40E+08	188.91	1042.8	217.24	5031.58	8.46	146.42
9:00	786.62	551.71	69.07	1.40E+08	190.82	1049.2	215.06	4982.93	6.62	146.25
9:01	788.83	548.49	69.17	1.39E+08	190.07	1051.71	220.83	5099.43	6.93	146.26
9:02	789.53	542.59	69.5	1.39E+08	192.69	1061.18	228.44	5257.55	6.51	146.26
9:03	786.87	536.72	69.5	1.39E+08	192.86	1061.32	225.55	5190.76	5.61	146.35
9:04	785.26	535.29	69.5	1.39E+08	189.92	1057.1	228.03	5248.23	6.77	146.47
9:05	785.7	543.35	68.42	1.37E+08	191.73	1059.73	223.95	5102.65	6.63	146.78
9:06	785.68	544.98	67.84	1.37E+08	191.86	1057.32	221.56	5036.06	6.58	146.82
9:07	787.38	542.75	67.84	1.37E+08	192.95	1060.94	223.98	5090.53	7.6	146.9
9:08	788.73	541.53	67.91	1.37E+08	192.92	1073.6	229.84	5222.11	8.73	146.55
9:09	788.98	541.32	68.88	1.37E+08	193	1078.68	229.97	5224.32	7.76	146.59
9:10	789.09	541.54	68.88	1.37E+08	191.68	1075.47	229.19	5206.11	6.7	146.59
9:11	787.17	538.97	68.88	1.37E+08	193.75	1079.77	228.91	5199.45	7.49	146.63
9:12	787.14	541.04	67.55	1.36E+08	192.02	1075.74	230.76	5194.79	8.06	146.69
9:13	785.99	543.32	67.48	1.36E+08	192.27	1081.75	229.56	5167.82	6.11	146.81
9:14	783.87	542.26	67.48	1.36E+08	192.87	1082.95	229.5	5165.61	6.9	147.14
9:15	784.66	535.84	67.48	1.36E+08	193.4	1088.69	228.41	5142.9	6.85	147.17
9:16	786.91	538.17	68.12	1.36E+08	194.78	1089.91	228.48	5154.29	7.13	147.22
9:17	788.82	544.67	68.15	1.36E+08	193.46	1086.95	226.49	5109.14	6.38	146.81
9:18	788.36	543.41	68.15	1.36E+08	192.5	1090.85	228.19	5147.45	7.86	146.8
9:19	789.63	539.44	68.15	1.36E+08	195.66	1092.57	230.83	5206.21	7.6	146.93
9:20	787.51	538.93	68.15	1.36E+08	196.15	1096.44	232.52	5244.6	6.52	146.9
9:21	785.22	536.3	68.15	1.36E+08	195.15	1097.11	230.79	5206.17	5.34	146.91
9:22	785.99	542.94	68.15	1.36E+08	194.05	1097.78	230.66	5203.96	6.15	147.31
9:23	785.65	545.34	68.15	1.36E+08	195.12	1100.18	228.79	5161.13	5.89	147.3
9:24	787.15	540.95	67.57	1.35E+08	195	1098.68	228.43	5124.13	6.78	147.34
9:25	788.66	539.25	67.29	1.35E+08	195.66	1092.33	229.26	5133.21	6.23	147.02
9:26	789.05	538.67	67.3	1.35E+08	193.24	1092.06	231.16	5175.59	6.51	146.91
9:27	789.6	539.22	66.91	1.35E+08	195.09	1092.18	229.22	5117.01	6.92	146.94
9:28	788.87	540.32	66.56	1.34E+08	193.84	1091.78	229.72	5116.77	6.56	147.01
9:29	788.96	540.56	66.56	1.34E+08	195.22	1090.48	227.76	5074.41	5.85	147.01
9:30	787.85	539.7	66.65	1.34E+08	193.7	1085.08	228.36	5080.64	4.75	147.06
9:31	787.45	538.17	67.32	1.34E+08	193.19	1086.44	228.59	5072.68	6.23	147.49
9:32	789.18	539.48	67.32	1.34E+08	191.71	1092.97	230.12	5106.01	7.39	147.6
9:33	789.13	538.63	67.32	1.34E+08	192.81	1099.76	229.73	5097.32	8.73	147.59
9:34	790.14	531.73	67.33	1.34E+08	192.98	1100.05	231.93	5144.87	7.95	147.33
9:35	789.86	531.76	67.14	1.34E+08	193.41	1101.06	234.13	5189.25	7.6	147.31
9:36	788.53	539.41	67.14	1.34E+08	194.43	1101.56	233.22	5169.3	6.69	147.34
9:37	787.31	544.48	67.14	1.34E+08	193.96	1104.7	232.09	5145.03	6.69	147.33
9:38	787.74	545.7	66.08	1.33E+08	195.31	1110.47	233.19	5155.13	7.1	147.3
9:39	788.09	539.53	66.04	1.33E+08	198.99	1110.02	230.64	5097.77	6.02	147.35

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
9:40	785.8	526.48	66.04	1.33E+08	198.26	1099.48	231.68	5122.05	5.08	147.78
9:41	785.27	536.51	66.2	1.33E+08	197.14	1094.63	232.47	5122.25	6.76	147.76
9:42	783.5	535.47	66.32	1.32E+08	195.33	1098.24	236.41	5197.15	7.72	147.72
9:43	786.08	530.33	66.32	1.32E+08	199.25	1096.86	231.95	5098.25	6.71	147.43
9:44	788.15	539.4	66.31	1.32E+08	198.31	1092.07	233.52	5130.99	5.79	147.26
9:45	788.6	542.16	66.07	1.32E+08	195.9	1106.54	236.73	5174.9	5.07	147.24
9:46	790.4	542.79	66.07	1.32E+08	196.34	1112.46	235.94	5157.41	7.68	147.26
9:47	790.15	546.24	66.07	1.32E+08	198.74	1109.32	235.57	5150.77	4.47	147.24
9:48	787.17	540.43	66.39	1.32E+08	196.44	1104.47	236.73	5183.58	6.94	147.32
9:49	786.17	534.92	66.47	1.32E+08	196.84	1108.75	235.96	5170.88	6.21	147.66
9:50	782.72	533.13	66.47	1.32E+08	199.26	1108.88	233.24	5109.49	6.28	147.69
9:51	779.41	538.48	66.47	1.32E+08	198.84	1093.03	228.45	5006.44	6.01	147.71
9:52	779.13	544.25	66.61	1.32E+08	195.35	1090.32	231.46	5078.05	5.86	147.29
9:53	776.44	532.9	66.65	1.32E+08	197.51	1105.4	231.12	5071.88	6.7	147.37
9:54	772.77	519.39	66.65	1.32E+08	199.26	1104.01	232.39	5100.49	5.17	147.4
9:55	770.12	515.87	66.26	1.32E+08	198.69	1103.8	233.34	5106.03	5.6	147.39
9:56	768.54	527.11	64.85	1.31E+08	196.54	1095.53	233.04	5076.87	4.92	147.36
9:57	768.36	531.07	64.85	1.31E+08	197.11	1098.89	230.31	5018.01	7.35	147.53
9:58	768.55	524.64	64.85	1.31E+08	199.72	1102.92	231.07	5030.33	7.77	147.79
9:59	769.31	520.23	64.97	1.30E+08	201.55	1109.88	236.81	5119.26	6.61	147.77
10:00	768.45	517.13	64.97	1.30E+08	199.27	1121.36	241.53	5220.99	6.67	147.68
10:01	769.92	522.93	64.97	1.30E+08	197.49	1130.96	240.91	5208.06	7.76	147.31
10:02	768.54	526.3	64.6	1.29E+08	199.69	1131.15	236.93	5082.3	7.95	147.3
10:03	768.37	529.02	64.15	1.29E+08	200.96	1124.42	234.32	5002.48	6.67	147.22
10:04	770.57	533.49	64.15	1.29E+08	202.32	1117.64	233.09	4976.98	6.92	147.32
10:05	769.35	529.61	64.78	1.29E+08	201.16	1118.68	233.31	4989.65	5.96	147.38
10:06	769.11	521.22	66.04	1.29E+08	201.36	1115.34	234.07	5026.81	4.47	147.82
10:07	769.5	522.14	66.04	1.29E+08	201.5	1110.69	234.97	5046.02	5.68	147.83
10:08	766.63	521.83	66.04	1.29E+08	201.13	1114.24	234.28	5031.07	4.93	147.84
10:09	767.93	525.26	66.04	1.30E+08	201.01	1116.69	232.12	4993.19	6.19	147.57
10:10	767.74	530.23	66.04	1.30E+08	200.55	1113.17	230.5	4974.73	5.86	147.42
10:11	766.6	533.68	66.04	1.30E+08	199.18	1110.51	232.88	5026.29	5.75	147.34
10:12	767.12	536.01	66.04	1.30E+08	200.75	1111.16	233.41	5037.16	5.83	147.41
10:13	769.46	532.88	65.79	1.31E+08	201.7	1108.23	232.92	5063.02	6.84	147.46
10:14	769.4	526.49	65.73	1.31E+08	203.85	1102.28	231.33	5028.24	6.77	147.51
10:15	770.85	530.24	65.73	1.31E+08	202.37	1103.35	231.65	5037.09	6.59	147.89
10:16	769.77	536.29	64.87	1.30E+08	201.1	1099.98	231.5	5001.03	5.83	147.91
10:17	770.6	533.5	64.7	1.30E+08	200.98	1103.86	233.11	5030.69	5.22	147.83
10:18	780.29	548.83	64.7	1.30E+08	203.67	1108.49	233.13	5030.84	4.42	147.52
10:19	788.89	557.65	64.7	1.30E+08	204.22	1111.18	235.84	5089.03	4.41	147.47
10:20	794.62	546.62	64.7	1.30E+08	202.44	1105.33	237.46	5125.76	4.93	147.5
10:21	795.5	536.48	64.7	1.30E+08	203.28	1110.06	242.71	5237.95	5.96	147.43

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
10:22	795.95	544.09	64.7	1.30E+08	200.07	1116.49	239.82	5175.36	6.46	147.5
10:23	794.61	551.94	64.7	1.30E+08	197.13	1117.79	237.22	5119.68	5.94	147.65
10:24	790.76	554.04	66.54	1.31E+08	197.98	1112	234.21	5074.68	7.45	147.92
10:25	793.16	552.89	66.87	1.31E+08	199.87	1106.7	234.73	5085.51	5.4	147.91
10:26	797.75	558.44	66.87	1.31E+08	198.54	1106.58	236.81	5130.94	5.84	147.96
10:27	801.94	565.17	67.4	1.31E+08	197.09	1105.27	237.1	5166.33	5.51	147.44
10:28	804.66	563.32	68	1.32E+08	197.84	1105.68	235.1	5151.39	6.01	147.51
10:29	807.95	562.39	68	1.32E+08	199.9	1102.66	233.88	5125.18	5.42	147.51
10:30	807.06	560.68	68	1.32E+08	199	1096.7	232.05	5085.58	4.92	147.52
10:31	807.61	560.13	68.67	1.34E+08	198.29	1092.61	233.77	5215.08	5.58	147.62
10:32	806.14	559.37	68.7	1.35E+08	197.85	1095.14	236.44	5283.48	5.24	147.79
10:33	805.19	558.78	68.7	1.35E+08	199.91	1095.66	234.7	5245.25	4.37	148.02
10:34	805.85	559.16	68.89	1.35E+08	199.07	1091.82	235.87	5292.98	5.08	148.08
10:35	806.87	557.78	69.38	1.36E+08	198.68	1102.21	238.87	5406.06	6.01	148.03
10:36	808.6	557.21	69.38	1.36E+08	198.31	1103.6	240.35	5439.88	4.89	147.76
10:37	807.28	559.33	69.38	1.36E+08	197.53	1110.06	242.39	5485.1	5.65	147.73
10:38	806.4	564.46	69.08	1.37E+08	196.78	1114.5	242.52	5504.51	5.28	147.84
10:39	805.27	565.72	68.98	1.37E+08	197.68	1117.61	240.02	5454.26	5.94	147.85
10:40	806.99	566.32	68.98	1.37E+08	199.52	1115.36	238.59	5422.68	6.69	148.08
10:41	805.6	560.03	69.21	1.37E+08	198.6	1110.66	239.56	5457.06	6.89	148.54
10:42	806.34	558.12	69.38	1.37E+08	199.56	1104.68	240.25	5475.99	6.2	148.57
10:43	807.58	555.56	69.38	1.37E+08	198.79	1108.75	242.75	5533	7.28	148.62
10:44	807.51	555.89	69.35	1.37E+08	198.41	1117.16	241.99	5514.57	6.56	148.38
10:45	807.54	559.72	68.73	1.37E+08	200.67	1116.26	241.39	5483.43	5.07	148.29
10:46	806.68	562.14	68.73	1.37E+08	197.9	1124.98	244.15	5547.07	7.55	148.32
10:47	805.31	566.62	68.73	1.37E+08	199.8	1121.86	241.49	5485.7	6.15	148.4
10:48	805.64	568.84	68.73	1.37E+08	198.03	1123.62	241.89	5494.91	6.84	148.46
10:49	807.27	562.95	69.24	1.37E+08	198.86	1119.74	238.76	5430	6.52	148.48
10:50	808.61	556.81	69.29	1.37E+08	198.14	1116.95	238.69	5428.04	5.12	148.87
10:51	808.41	553.22	69.29	1.37E+08	197.86	1116.01	240.58	5471.25	5.51	148.88
10:52	807.48	552.73	68.96	1.37E+08	197.43	1113.8	240.99	5470.06	6.65	148.9
10:53	807.62	557.18	68.73	1.37E+08	196.44	1119.16	241.12	5467.97	6.03	148.68
10:54	807.57	560.94	68.73	1.37E+08	197.35	1119.64	240.02	5442.98	5.49	148.47
10:55	808.49	560.41	68.4	1.36E+08	197.14	1116.91	239.86	5429.44	5.06	148.54
10:56	809.62	555.92	67.78	1.36E+08	196.89	1114.96	242.69	5474.52	5.65	148.59
10:57	810.6	552.94	67.78	1.36E+08	194.22	1120.55	246.82	5566.76	6.88	148.72
10:58	809.17	554.02	67.78	1.36E+08	194.36	1130.76	246.28	5557.97	5.92	148.84
10:59	807.11	553.81	69.65	1.36E+08	195.08	1131.83	243.79	5511.07	5.45	149.08
11:00	807.03	554.92	69.71	1.36E+08	197.23	1129.14	240.12	5427.39	6.7	148.91
11:01	807.26	558.46	69.71	1.36E+08	195.28	1128.09	237.12	5359.66	7.61	148.84
11:02	808.03	561.93	67.38	1.35E+08	196.73	1125.17	234.06	5254.19	6.3	148.37
11:03	808.28	560.32	67.17	1.35E+08	196.94	1124.03	234.46	5258.14	5.35	147.97

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
11:04	810.74	554.35	67.17	1.35E+08	197.67	1126.73	232.89	5222.34	5.18	147.98
11:05	811.28	549.04	68.27	1.36E+08	197.54	1127.43	231.49	5213.28	7.1	147.96
11:06	809.87	550.03	69.23	1.36E+08	197.15	1127.82	233.19	5268.87	7.73	147.9
11:07	807.7	554.58	69.23	1.36E+08	196.82	1128.94	231.19	5223.56	7.41	148.12
11:08	806.48	556.19	68.55	1.36E+08	196.54	1125.76	230.03	5179.73	6.38	148.28
11:09	806.72	556.67	67.3	1.35E+08	197.23	1120.68	229.16	5125.41	6.04	148.23
11:10	807.8	556.65	67.3	1.35E+08	198.77	1119.83	226.7	5069.62	7.18	148.1
11:11	810.33	552.15	67.26	1.35E+08	198.15	1119.14	225.39	5040.85	6.26	147.8
11:12	811.74	546.92	66.96	1.35E+08	196.49	1114.48	225.66	5049.84	7.54	147.74
11:13	811.53	541.47	66.96	1.35E+08	196.08	1120.49	223.53	5000.73	7.63	147.71
11:14	810.4	546.98	66.96	1.35E+08	194.35	1123.44	225.53	5044.32	7.82	147.69
11:15	808.39	554.57	66.38	1.33E+08	195.76	1122.22	223.73	4939.93	5.89	147.62
11:16	807.32	555.24	66.38	1.33E+08	196.41	1115.32	220.66	4873.6	5.76	148.13
11:17	807.97	553.21	66.38	1.33E+08	197.64	1116.95	224.4	4955.27	6.35	148.14
11:18	808.54	550.23	66.38	1.33E+08	198.4	1122.78	226.36	4999.29	5.01	148.19
11:19	809.03	548.83	66.38	1.33E+08	196	1122.03	227.93	5032.41	5.94	147.88
11:20	808.94	549.65	66.38	1.33E+08	194.74	1127.66	230.16	5083.16	8.03	147.78
11:21	808.96	554.09	66.38	1.33E+08	196.93	1125.83	227.4	5021.18	6.87	147.79
11:22	808.48	556.54	66.38	1.33E+08	197.59	1113.69	222.33	4908.53	5.95	147.75
11:23	809.04	555.18	66.38	1.33E+08	198.34	1101.34	221.27	4886.63	5.76	147.68
11:24	809.7	552.19	66.95	1.33E+08	198.23	1096.68	222.4	4915.35	5.21	147.83
11:25	808.88	547.96	67.94	1.33E+08	197.71	1092.92	223.46	4948.75	4.79	148.46
11:26	808.41	548.17	67.94	1.33E+08	196.39	1096.44	227.09	5028.5	6.84	148.58
11:27	806.05	550.14	67.94	1.33E+08	195.36	1103.42	230.66	5108.29	8.78	148.63
11:28	804.87	547.82	67.33	1.34E+08	196.34	1109.4	230.03	5096.99	6.93	148.32
11:29	805.11	546.71	67.14	1.34E+08	198.99	1110.87	228.83	5071.99	5.76	148.25
11:30	799.44	540.2	67.14	1.34E+08	197.15	1104.88	228.63	5067.56	6.36	148.19
11:31	795.78	535.33	66.99	1.34E+08	196.29	1105.2	228.83	5082.82	5.99	148.16
11:32	794.2	538.74	66.93	1.34E+08	197.34	1111.62	229.72	5103.08	5.69	148.12
11:33	793.6	545.41	66.93	1.34E+08	197.42	1110.86	224.25	4983.19	6.09	148.18
11:34	786.83	534.31	66.95	1.34E+08	197.59	1108.95	221.53	4912.89	6.45	148.49
11:35	785.79	523.79	67.02	1.33E+08	198.59	1115.41	224.56	4962.37	5	148.5
11:36	783.41	526.03	67.02	1.33E+08	200.67	1113.95	226.48	5004.5	6.02	148.51
11:37	776.4	516.75	66.35	1.32E+08	197.82	1117.55	227.43	4990.87	6.08	148.08
11:38	773.22	517.53	64.91	1.32E+08	197.51	1125.89	225.7	4926.17	5.14	148.11
11:39	771.95	526.47	64.91	1.32E+08	198.96	1124.92	228.53	4987.24	4.49	148.07
11:40	771.8	528.92	64.91	1.31E+08	200.54	1130.5	227.07	4946.85	4.74	148.1
11:41	769.19	522.01	64.66	1.30E+08	202.05	1119.57	227.3	4902.61	6.41	148.11
11:42	770.77	520.53	64.66	1.30E+08	202.22	1121.71	233.63	5038.53	6.26	148.5
11:43	773.29	525.47	64.66	1.30E+08	200.24	1128.24	233.32	5031.94	6.01	148.42
11:44	771.01	523.71	64.64	1.29E+08	201.84	1129.19	231.33	4968.69	6.02	148.35
11:45	772.82	518.23	64.51	1.28E+08	204.61	1123.71	226.02	4808.69	5.24	148.35

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
11:46	774.61	518.33	64.51	1.28E+08	202.22	1117.56	230.17	4898.13	5.58	148.34
11:47	776	526.63	64.51	1.28E+08	202.38	1128.24	234.62	4991.71	7.68	148.39
11:48	776.3	523.46	66.11	1.29E+08	203.43	1124.09	229.37	4914.43	6.12	148.53
11:49	774.56	517.46	66.32	1.29E+08	202.57	1115.93	229.48	4919.58	5.92	148.57
11:50	773.83	514.34	66.32	1.29E+08	202.49	1118.62	232.68	4988.29	9.19	148.8
11:51	773.5	513.6	66.29	1.29E+08	199.86	1118.34	231.88	4971.83	8.79	148.88
11:52	772.85	511.65	64.88	1.29E+08	200.77	1124.91	231.37	4963.19	8.26	148.96
11:53	772.3	517.29	64.88	1.29E+08	200.97	1127.32	229.62	4924.58	6.77	148.7
11:54	773.02	522.6	64.88	1.29E+08	200.69	1120.76	227.13	4871.71	7.84	148.31
11:55	772.47	525.37	66.03	1.30E+08	200.3	1118.9	226.12	4888.17	4.64	148.17
11:56	776.59	536.43	66.26	1.30E+08	200.58	1115.41	224.77	4860.07	7.83	148.25
11:57	784.92	542.34	66.26	1.30E+08	202.83	1111.3	223.79	4838.48	5.83	148.34
11:58	789.24	527.9	66.74	1.30E+08	201.1	1106.6	224.12	4851.67	6.82	148.42
11:59	788.87	526.11	66.99	1.31E+08	203.69	1104.74	224.5	4864.46	7.08	148.78
12:00	788.54	535.59	66.99	1.31E+08	199.69	1096.77	224.2	4857.81	4.89	148.8
12:01	788.88	535.84	67.1	1.31E+08	196.38	1105.32	226.07	4917.86	5.83	148.8
12:02	797.74	541.83	67.42	1.32E+08	199.32	1113.7	224.01	4915.98	6.19	148.46
12:03	798.19	548.82	67.42	1.32E+08	198.93	1123.3	227.19	4986.18	5.59	148.46
12:04	798.36	552.55	67.42	1.32E+08	196.82	1124.8	225.76	4957.59	4.04	148.24
12:05	799.66	556.78	68.09	1.33E+08	194.54	1111.29	225.08	4984.14	4.64	148.17
12:06	800.96	555.95	68.12	1.33E+08	197.14	1098.05	219.76	4866.79	3.55	148.38
12:07	802.05	551.9	68.12	1.33E+08	195.49	1088.05	222.3	4922.22	4.54	148.43
12:08	799.71	550.81	69.89	1.35E+08	195.17	1085.02	225.48	5067.68	4.72	148.76
12:09	799.17	553.35	70.08	1.36E+08	194.06	1086.3	227.4	5115.63	4.15	148.77
12:10	799.02	554.9	70.08	1.36E+08	197	1086.06	225.47	5073	4.81	148.79
12:11	800.07	557.48	70.08	1.36E+08	199.13	1082.55	222.63	5007.75	4.98	148.39
12:12	800.85	558.5	69.54	1.37E+08	198.29	1077.25	222.96	5057.55	5.94	148.38
12:13	802.07	557.28	69.44	1.37E+08	197.85	1085.78	226.58	5144.65	9.27	148.39
12:14	803.21	554.04	69.44	1.37E+08	200.55	1091.94	226.99	5153.73	7.44	148.36
12:15	803.66	552.7	69.54	1.37E+08	199.08	1089.78	227.69	5188.48	8.86	148.21
12:16	802.07	554.24	69.63	1.38E+08	198.6	1089.13	227.51	5198.39	9.92	148.36
12:17	802.04	553.33	69.63	1.38E+08	199.7	1096.22	226.65	5177.9	4.59	148.74
12:18	805.88	550.61	69.63	1.38E+08	200.59	1097.78	228.82	5228.17	7.26	148.69
12:19	807.18	543.63	69.63	1.38E+08	200.9	1095.28	230.98	5278.4	5.33	148.4
12:20	808.62	535.24	69.63	1.38E+08	200.29	1092.6	229.97	5255.44	8.16	148.09
12:21	807.85	539.28	69.62	1.38E+08	197.39	1094.34	231.49	5289.6	5.34	148.02
12:22	804.87	547.34	69.62	1.38E+08	195.44	1096.47	227.25	5191.35	3.97	148
12:23	805.1	549.14	69.62	1.38E+08	196.56	1096.99	224.39	5127.29	5.57	148.02
12:24	804.96	550.42	69.34	1.37E+08	197.03	1106.25	228.21	5192.11	9.03	148.1
12:25	806.61	546.15	68.06	1.36E+08	197.55	1105.4	224.43	5075.22	5.41	148.46
12:26	806.72	541.27	68.06	1.36E+08	196.1	1098.33	225.01	5088.9	7.78	148.28
12:27	804.67	537.92	68.06	1.36E+08	195.54	1108.22	224.83	5084.45	10.02	148.14

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
12:28	805.18	537.28	69.26	1.36E+08	193.91	1102.2	221.46	5009.85	5.77	147.89
12:29	806.66	548.61	69.44	1.36E+08	194.37	1093.39	222.94	5041.59	5.14	147.82
12:30	805.13	557	69.44	1.36E+08	195.49	1093.13	224.48	5077.74	4.74	147.88
12:31	802.93	556.04	69.51	1.36E+08	196.52	1096.34	226.77	5129.8	5.94	147.85
12:32	805.44	559.46	69.56	1.36E+08	196.97	1101.65	232.35	5254.35	5.58	147.81
12:33	803.64	558.29	69.56	1.36E+08	199.43	1102.59	229.2	5184.12	4.45	147.76
12:34	802.67	548.75	69.56	1.36E+08	198.65	1091.27	230.56	5215.86	7.6	147.78
12:35	807.18	542.53	69.91	1.37E+08	198.77	1098.33	230.94	5262.05	10	147.71
12:36	809.2	543.03	69.99	1.38E+08	200.14	1097.79	227.92	5204.73	8.52	147.57
12:37	810.15	549.27	69.99	1.38E+08	199.89	1096	221.19	5051.75	6.77	147.68
12:38	806.32	548.22	68.31	1.37E+08	199.41	1096.24	221.97	5042.24	10.18	147.65
12:39	802.92	539.32	67.97	1.37E+08	198.34	1098.94	228.67	5186.9	11.09	147.72
12:40	806.56	549.44	67.97	1.37E+08	198.19	1105.63	228.52	5182.25	10.39	147.73
12:41	805.9	558.41	68.26	1.36E+08	194.53	1101.56	228.64	5171.04	7.61	147.68
12:42	806.27	550.86	68.55	1.36E+08	195.29	1105.16	227.25	5129.94	8.85	147.7
12:43	806.42	544.12	68.55	1.36E+08	196.38	1103.41	231.99	5235.98	9.67	148.07
12:44	803.89	543.16	68.55	1.36E+08	197.07	1108.72	230.76	5208.85	7.36	148.07
12:45	802.52	544.93	68.62	1.36E+08	193.41	1097.51	227.09	5118.49	5.52	148.06
12:46	803.83	554.77	69.32	1.35E+08	193.32	1096.77	228.78	5144.2	6.6	148.03
12:47	804.19	558.99	69.32	1.35E+08	196.48	1105.89	232.36	5225.02	9.33	147.7
12:48	806.37	551.31	69.57	1.36E+08	198.72	1109.29	231.11	5220.46	6.84	147.49
12:49	809.33	543.65	71.24	1.38E+08	199.94	1102.73	230.84	5270.81	6.8	147.39
12:50	808.38	541.82	71.24	1.38E+08	200.23	1103.6	228.77	5225.21	8.94	147.46
12:51	804.8	546.3	71.25	1.38E+08	195.95	1108.69	230.32	5259.5	12.74	147.68
12:52	803.3	550.46	69.86	1.38E+08	196.33	1107.18	231.61	5284.46	9.6	147.87
12:53	803.6	550.45	68.28	1.37E+08	200.02	1103.98	231.03	5267.17	7.51	147.9
12:54	803.37	548.89	68.28	1.37E+08	199.35	1100.47	233	5312.77	6.23	147.9
12:55	798.83	543.03	68.8	1.38E+08	197.77	1107.37	237.45	5421.3	9.15	147.86
12:56	805.4	542.41	70.12	1.38E+08	195.97	1110.03	237.5	5441.16	7.02	147.47
12:57	807.8	552.91	70.12	1.38E+08	197.03	1111.26	236.41	5416.16	7.86	147.48
12:58	804.61	553.05	70.12	1.38E+08	197.08	1112.75	235.42	5393.32	10.63	147.42
12:59	806.2	549.92	69.24	1.37E+08	199.41	1119.27	236.62	5389.95	13.74	147.38
13:00	805.55	547.07	67.73	1.36E+08	200.08	1119.74	238.7	5375.89	10.2	147.68
13:01	806.32	542.14	67.73	1.36E+08	200.52	1123.18	230.72	5195.57	9.51	147.81
13:02	806.58	540.37	67.73	1.36E+08	197.5	1123.84	233.02	5246.9	8.18	147.8
13:03	804.88	543.71	68.02	1.36E+08	197.35	1125.59	233.4	5253.39	9.37	147.78
13:04	805.28	546.76	68.03	1.36E+08	199.01	1126.65	234.52	5278.07	11.25	147.69
13:05	805.83	548.12	68.03	1.36E+08	199.44	1127.73	232.65	5237.64	8.59	147.49
13:06	805.88	550.49	68.53	1.35E+08	199.05	1130.42	234.12	5235.69	16.18	147.51
13:07	806.44	548.76	68.73	1.35E+08	200	1134.55	233.92	5227.45	12.64	147.55
13:08	804.16	542.82	68.73	1.35E+08	198.98	1135.64	235.41	5260.9	14.41	147.56
13:09	805.26	538.2	69.07	1.36E+08	199.97	1130.92	234.85	5281.79	8.97	147.87

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
13:10	805.57	537.72	69.23	1.36E+08	198.84	1130.54	235.65	5305.76	7.94	147.92
13:11	806.56	543.53	69.23	1.36E+08	198.48	1133.87	237.87	5357.64	6.32	147.85
13:12	807.44	546.78	69.23	1.36E+08	198.76	1128.66	237.21	5341.84	5.42	147.61
13:13	806.95	542.58	67.75	1.35E+08	198.76	1134.13	237.14	5325.38	7.14	147.45
13:14	809.4	534.86	67.42	1.35E+08	199.13	1138.1	240.07	5392.76	6.66	147.49
13:15	810.17	543.12	67.42	1.35E+08	195.99	1131.28	241.46	5424.28	6.66	147.56
13:16	805.31	549.21	67.39	1.35E+08	193.34	1124.1	242.07	5424.94	6.6	147.49
13:17	800.06	546.76	67.33	1.34E+08	192.22	1131.31	243.84	5437.29	6.86	147.57
13:18	799.8	545.02	67.33	1.34E+08	196.47	1138	245.54	5475.21	7.07	147.91
13:19	803.28	550.72	67.33	1.34E+08	198.7	1137.72	244.12	5443.94	6.71	147.97
13:20	806.65	553.71	67.33	1.34E+08	197.35	1134.95	238.82	5325.86	3.68	147.94
13:21	805.52	551.07	67.33	1.34E+08	194.07	1132.93	239.14	5332.59	8.08	147.55
13:22	805.48	546.54	67.33	1.34E+08	195.56	1138.43	238.97	5330.2	6.41	147.53
13:23	805.95	551.21	67.33	1.34E+08	194.07	1127.74	236.97	5285.52	3.8	147.49
13:24	808.11	558.08	68.03	1.35E+08	190.79	1122.28	236.85	5286.44	5.65	147.49
13:25	806.31	552.35	69.69	1.35E+08	191.05	1136.02	241.39	5395.23	9.3	147.61
13:26	807.12	541.47	69.69	1.35E+08	195.37	1155.53	246.47	5509.09	16.95	147.95
13:27	809.53	540.43	69.68	1.35E+08	194.44	1159.27	248.16	5547	8.43	147.97
13:28	809.36	544.17	69.37	1.36E+08	194.21	1150.3	244.5	5509.69	10.3	147.96
13:29	809.07	542.62	69.29	1.36E+08	194.74	1148	244.15	5505.24	13.54	147.56
13:30	808.62	540.49	69.28	1.36E+08	193.46	1156.58	243.18	5482.85	9.43	147.55
13:31	807.95	549.16	67.58	1.36E+08	191.93	1159.37	243.36	5478.39	6.6	147.61
13:32	803.64	555.84	66.96	1.36E+08	191.56	1162.45	242.19	5448.61	4.75	147.62
13:33	805.59	554.4	66.96	1.36E+08	191.37	1158.45	243.56	5480.18	10.23	147.62
13:34	808.1	550.03	66.96	1.36E+08	193.6	1159.52	244.86	5509.47	6.28	147.89
13:35	808.94	548.19	68.48	1.36E+08	194.67	1150.16	244.63	5516.32	6.49	148.01
13:36	808.06	547.35	70.67	1.36E+08	191.08	1146.47	242.26	5477.61	8.06	147.93
13:37	809.62	545.9	70.67	1.36E+08	189.13	1153.09	244.16	5520.6	8.46	147.6
13:38	808.66	542.55	70.37	1.36E+08	193.61	1155.38	243.16	5499.53	7.02	147.61
13:39	808.14	544.99	69.69	1.36E+08	194.05	1149.28	242.57	5490.27	6.27	147.7
13:40	804.83	555.07	69.69	1.36E+08	190.98	1149.08	244.83	5540.06	5.08	147.62
13:41	804.5	558.1	69.69	1.36E+08	190.61	1159.91	245.26	5551.53	7.18	147.66
13:42	803.58	551.1	69.51	1.38E+08	193.41	1159.9	247.44	5653.11	4.91	147.72
13:43	806.1	546.82	69.41	1.38E+08	196.86	1155.4	246.94	5653.73	5.75	147.66
13:44	808.28	547.81	69.41	1.38E+08	193.11	1150.64	245.81	5628.34	6.81	147.75
13:45	809.46	549.83	69.39	1.37E+08	193.41	1153.17	243.98	5562.21	6.86	147.71
13:46	807.07	549.54	69.38	1.37E+08	195.02	1164.38	244.02	5551.4	5.68	147.58
13:47	806.92	546.26	69.38	1.37E+08	196.77	1167.48	240.79	5478.63	6.78	147.63
13:48	808.14	542.04	69.38	1.37E+08	195.74	1161.32	238.77	5432.81	5.79	147.71
13:49	808.68	538.11	69.38	1.37E+08	194.97	1156.05	240.68	5470.32	6.8	147.57
13:50	812.13	541.36	69.38	1.37E+08	192.49	1155.3	242.28	5506.48	6.72	147.56
13:51	812.23	545.01	69.38	1.37E+08	190.5	1162.32	244.12	5547.55	10.74	147.45

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
13:52	812.43	545.53	68.7	1.36E+08	192.87	1178.99	243.79	5517.14	11.75	147.54
13:53	811.83	546.14	68.3	1.36E+08	192.56	1179.26	245.08	5540.7	8.46	147.49
13:54	808.57	544.09	68.3	1.36E+08	191.47	1172.07	243.87	5513.66	6.75	147.38
13:55	807.16	541.84	68.8	1.36E+08	191.16	1157.29	242.47	5481.93	4.06	147.32
13:56	809.13	547.52	69.26	1.36E+08	189.27	1157.89	243.06	5495.69	4.04	147.36
13:57	805.87	548.53	69.26	1.36E+08	191.7	1161.91	242.26	5477.61	5.43	147.48
13:58	805.21	545.26	69.14	1.36E+08	190.52	1159.24	245.16	5530.63	3.7	147.53
13:59	806.68	541.6	67.54	1.35E+08	190.82	1158.56	250.03	5596.86	6.39	147.53
14:00	807.51	541.35	67.54	1.35E+08	189.63	1161.1	251.1	5621.44	4.57	147.44
14:01	805.4	540.83	67.54	1.35E+08	189.53	1164.64	250.56	5610.41	2.96	147.46
14:02	803.68	544.23	68.24	1.35E+08	189.78	1165.85	251.3	5629.05	3.73	147.35
14:03	801.83	552.3	68.4	1.35E+08	190.4	1168.64	252.24	5649.33	4.65	147.42
14:04	799.87	554.81	68.4	1.35E+08	191.1	1173.8	250.65	5615.52	4.27	147.42
14:05	801.98	555.23	68.4	1.35E+08	191.53	1173.99	250.59	5613.95	4.1	147.41
14:06	803.69	551.79	69.35	1.35E+08	193.88	1165.41	247.67	5560.29	0	147.4
14:07	805.72	544.7	69.47	1.35E+08	192.76	1151.39	245.75	5515.4	3.84	147.45
14:08	806.81	536.8	69.47	1.35E+08	191.45	1152.49	246.75	5537.84	4.43	147.73
14:09	806.42	537.97	69.06	1.36E+08	191.2	1153.19	249.82	5621.9	4.75	147.76
14:10	798.78	534.1	68.52	1.36E+08	190.05	1155.13	247	5568.44	4.91	147.72
14:11	795.6	535.84	68.52	1.36E+08	190.16	1163.18	247.72	5584.22	4.65	147.51
14:12	800.26	548.02	68.37	1.35E+08	191.86	1167.19	246.79	5548.2	4.62	147.45
14:13	802.71	559.66	65.58	1.34E+08	191.98	1168.71	246.44	5482.88	4.55	147.45
14:14	802.6	557.43	65.58	1.34E+08	191.38	1169.78	248.77	5536.25	4.99	147.47
14:15	804.66	550.3	65.58	1.34E+08	192.81	1180.46	253.42	5638.77	3.22	147.42
14:16	806.21	544.02	68.86	1.34E+08	195.51	1173.5	251.87	5608.57	3.83	147.62
14:17	807.21	538.84	69.69	1.34E+08	192.46	1166.04	253.64	5646.55	5.56	147.73
14:18	806.32	538.97	69.69	1.34E+08	193.58	1165.75	254.03	5655.46	3.85	147.67
14:19	803.98	544.33	69.69	1.34E+08	195.3	1165.23	251.69	5604.29	4.04	147.58
14:20	802.34	549.75	69.69	1.34E+08	194.01	1168.67	251.84	5606.6	4.54	147.34
14:21	801.92	554.54	69.69	1.34E+08	194.2	1173.73	251.65	5604.29	4.4	147.31
14:22	802.72	555.26	69.69	1.34E+08	195.66	1176.48	250.83	5584.42	2.89	147.37
14:23	803.47	551.26	69.69	1.35E+08	193.84	1171.45	252.6	5644.37	3.53	147.31
14:24	804.17	546.01	69.69	1.35E+08	194.54	1166.7	251.08	5621.44	3.97	147.34
14:25	804.8	544.16	69.69	1.35E+08	194.56	1164.55	252.26	5648.43	4.26	147.64
14:26	802.74	542.85	69.47	1.35E+08	195.56	1165.86	249.85	5611.75	4.19	147.64
14:27	803.74	540.69	68.74	1.37E+08	195.56	1165.73	249.19	5663.83	5.56	147.6
14:28	806.22	546.24	68.73	1.37E+08	194.7	1169.19	251.56	5718.21	5.33	147.33
14:29	805.05	551.09	68.73	1.37E+08	193.32	1172.61	252.32	5734.08	3.96	147.29
14:30	802.53	544.8	67.45	1.36E+08	193.23	1169.27	251.65	5662.37	3.89	147.3
14:31	805.54	539.95	67.45	1.35E+08	193.18	1172.41	254.45	5722.19	3.3	147.35
14:32	805.8	541.68	67.45	1.35E+08	193.7	1180.66	252.05	5668.14	3.21	147.25
14:33	805.65	542.18	67.77	1.35E+08	191.94	1177.91	249.91	5611.58	7.12	147.41

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
14:34	804.93	542.49	68.73	1.35E+08	193.21	1176.74	249.99	5596.4	6.1	147.59
14:35	804.98	543.5	68.73	1.35E+08	193.59	1177.15	252.04	5641.34	3.09	147.58
14:36	804.06	542.33	68.73	1.35E+08	193.79	1176.6	252.01	5641.21	0	147.58
14:37	803.37	548.02	68.73	1.35E+08	193.37	1177.81	255.56	5721.97	3.79	147.33
14:38	803.31	549.94	68.73	1.35E+08	194.18	1189.16	256.18	5735.4	4.13	147.26
14:39	803.34	550.38	68.73	1.35E+08	196.2	1190.07	256.03	5731.05	4.3	147.21
14:40	804.19	550.99	69.08	1.36E+08	197.1	1188.03	254.37	5727.29	2.63	147.14
14:41	804.7	548.97	69.57	1.36E+08	197.49	1189.28	257.37	5825.21	3.92	147.23
14:42	804.91	547.81	69.57	1.36E+08	198.28	1184.67	258.14	5841.13	2.95	147.44
14:43	804.72	544.28	69.57	1.36E+08	198.9	1184	260.3	5890.92	3.55	147.54
14:44	803.85	544.01	69.82	1.37E+08	198.37	1186.53	262.88	5970.27	0	147.54
14:45	803.89	545.81	70.03	1.37E+08	198.11	1186.51	263.04	5987.26	3.95	147.05
14:46	803.68	552.55	70.03	1.37E+08	198.18	1192.56	257.79	5869.01	0	146.97
14:47	804.09	557.72	69.57	1.37E+08	198.69	1200.52	213.98	4866.57	3.57	147.02
14:48	803.73	551.26	68.06	1.37E+08	199.65	1205.41	202.42	4595.39	3.04	147
14:49	805.18	547.08	68.06	1.37E+08	201.05	1189.58	199.52	4529.54	0	146.95
14:50	805.66	548.82	68.06	1.37E+08	201.34	1179.41	199.78	4537.98	2.77	146.87
14:51	805.36	549.74	69.99	1.37E+08	199.8	1182.54	200.38	4562.02	4.59	146.93
14:52	803.11	548.46	69.99	1.37E+08	201.55	1185.82	192.58	4384.43	5.87	147.03
14:53	802.76	547.63	69.99	1.37E+08	200.68	1190.72	170.72	3884.35	2.95	147.07
14:54	801.84	552.58	67.66	1.36E+08	200.98	1186.1	164.01	3689.42	0	146.9
14:55	802.15	554.68	67.66	1.36E+08	200.25	1181.42	161.11	3624.13	0	146.68
14:56	800.43	552.39	67.66	1.36E+08	200.32	1174.38	159.92	3597.06	3.91	146.76
14:57	803.17	550.75	67.69	1.36E+08	201.49	1181.35	158.81	3578.14	0	146.75
14:58	804.27	550.92	69.32	1.36E+08	200.93	1177.97	158.89	3597.88	0	146.74
14:59	803.84	549.98	69.32	1.36E+08	202.38	1173.33	159.75	3615.91	0	146.84
15:00	803.28	548.8	69.32	1.36E+08	201.41	1175.11	161.33	3652.27	3.56	147.04
15:01	803.43	548.31	70.39	1.37E+08	200.92	1182.47	160.38	3641.93	3.97	147.09
15:02	803.1	549.66	70.85	1.37E+08	201.65	1182.65	160.12	3638.74	3.88	147.1
15:03	803.75	554.24	70.85	1.37E+08	201.47	1177.31	159.79	3631.92	3.7	146.76
15:04	803.35	553.32	70.49	1.37E+08	200.24	1173.95	161.37	3682.08	3.81	146.7
15:05	805.18	548.91	69.72	1.38E+08	201.9	1181.2	161.2	3703.13	4.37	146.71
15:06	806.09	544.3	69.72	1.38E+08	202.74	1174.11	159.85	3673.23	4.35	146.78
15:07	805.15	545.45	69.22	1.38E+08	200.93	1169.19	160.93	3687.13	4.4	146.69
15:08	802.26	551.92	67.21	1.37E+08	200.39	1173.94	162.84	3700.26	3.05	146.85
15:09	802.6	556.87	67.21	1.37E+08	201.5	1177.14	162.84	3700.24	3.9	146.99
15:10	804.81	559.4	67.21	1.37E+08	203.02	1179.32	163.07	3707.08	0	146.97
15:11	803.77	554	67.6	1.37E+08	204.88	1173.33	162.79	3691.45	2.99	146.96
15:12	805.61	546.84	68.67	1.36E+08	204.55	1170.08	163.17	3671.56	3.72	146.74
15:13	805.36	544.6	68.67	1.36E+08	203.11	1172.55	164.53	3700.78	2.66	146.74
15:14	805.25	547.26	68.67	1.36E+08	203.55	1175.4	162.94	3664.73	4.2	146.69
15:15	803.96	549	68.19	1.35E+08	204.31	1170.75	162.96	3643.66	2.62	146.68

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
15:16	803.87	549.69	68.03	1.34E+08	204	1177.02	163.58	3650.47	3.32	146.68
15:17	803.23	549.77	68.03	1.34E+08	203.95	1180.03	164.34	3665.98	0	146.88
15:18	801.74	555.57	68.03	1.34E+08	202.95	1178.56	163.09	3639.29	3.3	147.01
15:19	800.91	557.98	68.03	1.34E+08	201.3	1185.88	164.32	3666.04	3.74	147.06
15:20	802.34	557.73	68.03	1.34E+08	203.2	1188.62	162.91	3634.85	3.41	146.93
15:21	804	553.33	68.03	1.34E+08	206.32	1188.61	162.4	3623.67	4.13	146.68
15:22	804.54	548.32	68.03	1.34E+08	207.12	1182.02	161.12	3594.71	4.21	146.66
15:23	804.62	547.66	68.03	1.34E+08	206.12	1173.33	160.9	3590.25	5.88	146.68
15:24	803.92	550.62	68.35	1.35E+08	208.31	1173.24	160.58	3598.86	4.88	146.62
15:25	802.23	555.22	69.23	1.36E+08	207.46	1176.57	159.68	3598.55	4.15	146.65
15:26	802.25	556.54	69.23	1.36E+08	207.79	1182.59	160.53	3616.63	4.06	146.8
15:27	803.23	553.68	69.23	1.36E+08	208.27	1187.27	159.64	3596.4	2.71	146.92
15:28	803.24	552.64	69.23	1.36E+08	209.46	1179.29	159	3591.77	2.81	146.95
15:29	803.8	552.44	69.23	1.36E+08	205.54	1178.62	160.75	3631	4.64	146.8
15:30	803.6	551.97	69.23	1.36E+08	205.3	1185.26	161.56	3651.37	3.97	146.61
15:31	802.64	553.02	69.21	1.36E+08	207.93	1181.27	161.05	3643.28	0	146.58
15:32	803.78	553.46	69.08	1.37E+08	208.49	1176.61	160.88	3653.2	2.7	146.49
15:33	803.1	552.83	69.08	1.37E+08	208.58	1175.94	161	3655.45	3.1	146.36
15:34	803.39	551.68	68.84	1.37E+08	209.7	1180.62	160.05	3630.28	3.16	146.3
15:35	804.42	556.56	68.34	1.36E+08	208.66	1180.61	159.67	3612.28	3.59	146.57
15:36	803.7	560.2	68.34	1.36E+08	207.31	1181.29	161.04	3641.63	3.58	146.61
15:37	804.12	552.04	68.34	1.36E+08	208.6	1178.59	160.8	3637.11	3.91	146.59
15:38	805.55	548.2	68.86	1.36E+08	212.3	1175.95	160.77	3641.7	2.93	146.45
15:39	805.96	550.24	70.42	1.37E+08	207.55	1173.93	161.53	3674.44	0	146.29
15:40	803.7	552.98	70.42	1.37E+08	207.78	1176.6	161.51	3674.52	3.09	146.26
15:41	802.85	553.76	70.1	1.37E+08	208.88	1177.29	162.83	3700.99	3.6	146.28
15:42	803.01	555.98	68.03	1.36E+08	210.25	1187.98	161.63	3659.01	3.48	146.25
15:43	803.17	555.56	68.03	1.36E+08	209.66	1187.27	158.67	3593.27	3.73	146.26
15:44	797.65	550.86	68.03	1.36E+08	207.52	1178.61	157.85	3575.34	3.47	146.55
15:45	801.4	549.43	68.47	1.37E+08	207.12	1179.24	157.31	3577.55	3.29	147.07
15:46	804.15	552.02	70.24	1.38E+08	208.82	1184.61	167.36	3823.04	4.38	147.53
15:47	804.92	553.15	70.24	1.38E+08	209.73	1177.96	177.63	4056.02	3.19	147.77
15:48	805.21	551.67	70.21	1.38E+08	210.64	1173.26	181.08	4134.21	4.09	147.92
15:49	804.91	548.76	68.71	1.36E+08	210.15	1183.3	183.79	4161.83	4.63	148.17
15:50	803.45	551.45	68.71	1.36E+08	210.74	1194.67	184.33	4173.24	3.24	148.42
15:51	803.77	554.71	68.71	1.36E+08	208.3	1188.61	183.53	4155.09	4.27	148.59
15:52	800.62	553.34	67.76	1.36E+08	207.14	1191.96	183.87	4151.48	2.87	148.85
15:53	802.15	551.7	67.76	1.36E+08	207.51	1191.3	183.87	4150.69	4.56	149.32
15:54	805.21	556.09	67.76	1.36E+08	206.19	1181.95	182.52	4119.18	3.9	150.33
15:55	803.64	563.84	67.76	1.36E+08	205.63	1174.59	201.33	4543.51	3.08	151.21
15:56	803.73	561.43	69.38	1.36E+08	205.97	1176.61	217.12	4890.11	0	151.7
15:57	804.65	552.9	70.03	1.36E+08	206.8	1175.26	219.83	4947.54	4.66	152.37

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
15:58	805.8	549.13	70.02	1.36E+08	209.16	1172.63	217.86	4904.7	0	152.87
15:59	805	549.91	70.66	1.36E+08	207.76	1164.59	216.31	4895.43	2.52	153.36
16:00	804.13	553.13	71.22	1.37E+08	206.4	1169.96	218.96	4972.06	2.83	153.73
16:01	803.04	560.49	71.22	1.37E+08	206.79	1178.62	220.3	5001.51	3.84	154.35
16:02	803.48	561.5	71.21	1.37E+08	206.92	1184.63	221.7	5043.63	2.95	154.66
16:03	805.95	559.84	70.82	1.38E+08	206.56	1184.61	221.87	5094.59	2.93	154.97
16:04	806.73	557.43	70.82	1.38E+08	206.75	1178.61	221.15	5076.12	3.59	155
16:05	803.86	553.91	70.81	1.38E+08	205.85	1173.94	221.55	5083.68	3	155.07
16:06	804.15	553.11	70.54	1.38E+08	204.58	1177.27	223.1	5113.85	4.66	155.2
16:07	802.87	557.05	70.54	1.38E+08	205.14	1182.62	221.07	5068.12	5.29	155.37
16:08	803.12	562.13	70.54	1.38E+08	205.97	1181.94	220.52	5054.4	3.97	155.53
16:09	802.89	562.61	71	1.38E+08	205.99	1178.61	222.62	5108.45	5.16	155.64
16:10	802.98	561.27	72.07	1.38E+08	205.67	1177.26	222.47	5111.32	3.26	156.04
16:11	802.82	555.8	72.07	1.38E+08	205.87	1183.27	222.86	5120.4	4.41	156.22
16:12	803.25	551.53	72.02	1.39E+08	205.64	1171.92	222.92	5127.14	4.61	156.35
16:13	802.5	554.63	71.8	1.39E+08	205.59	1177.27	226.21	5215.66	4.31	156.45
16:14	801.64	560.34	71.8	1.39E+08	204.82	1185.29	226.48	5222.58	2.69	156.27
16:15	801.82	563.47	71.37	1.39E+08	206.53	1185.27	225.76	5205.39	3.23	156.29
16:16	803.42	561.46	70.58	1.39E+08	207.72	1180.6	226.43	5217.6	3.68	156.48
16:17	803.86	557.67	70.58	1.39E+08	209.04	1183.27	224.37	5171.44	3.41	156.74
16:18	804.77	553.76	70.58	1.39E+08	207.47	1181.29	226.84	5226.75	4.68	156.67
16:19	804.7	551.42	70.58	1.39E+08	205.9	1183.29	224.29	5169.02	2.92	156.69
16:20	803.57	554.58	70.57	1.39E+08	205.69	1179.3	222.43	5125.2	3.77	156.72
16:21	801.67	560.22	70.57	1.39E+08	205.92	1187.3	224.67	5178.13	4.21	156.77
16:22	802.34	563.09	70.57	1.39E+08	208.92	1198.66	223.19	5143.52	3.64	156.83
16:23	802.32	561.35	70.57	1.39E+08	208.12	1187.95	222.52	5127.32	3.05	156.86
16:24	803.77	557.7	70.57	1.39E+08	206.99	1184.66	221.96	5115.83	3.28	156.95
16:25	804.56	556.49	71	1.38E+08	204.43	1183.29	223.42	5125.18	3.78	157.02
16:26	804.03	557.19	71.06	1.38E+08	204.5	1185.29	221.84	5083.9	4.36	157.04
16:27	803.59	558.46	71.06	1.38E+08	203.17	1185.29	223.39	5120.8	4.59	157.05
16:28	803.91	558.27	71.06	1.38E+08	203.85	1191.31	222.03	5087.38	2.81	156.83
16:29	801.67	552.37	71.43	1.38E+08	205.6	1190.6	222.48	5092.19	4	156.76
16:30	804.91	553.14	71.46	1.38E+08	205.67	1192.64	222.92	5101.42	4.69	156.89
16:31	804.32	558.05	71.46	1.38E+08	203.22	1194.66	225.98	5172.37	3.75	156.91
16:32	804.27	556.35	71.34	1.38E+08	203.91	1202.02	226.61	5205.28	3.9	156.99
16:33	803.41	556.83	71.34	1.38E+08	205.71	1202.01	224.47	5157.16	2.98	157.35
16:34	803.47	555.83	71.34	1.38E+08	205.75	1206.03	224.72	5161.83	4.76	157.34
16:35	802.87	555.71	71.33	1.38E+08	206.28	1203.99	223.54	5133.59	4.65	157.37
16:36	803.35	554.04	70.94	1.38E+08	208.5	1195.32	223.63	5133.85	3.97	157.24
16:37	804.07	554.88	70.94	1.38E+08	208.87	1185.27	224.74	5159.03	4.69	157.05
16:38	804.25	554.57	70.94	1.38E+08	212.56	1188.62	225.93	5186.62	3.17	157.02
16:39	806	555.21	71.97	1.39E+08	213.92	1193.99	223.96	5160.88	3.74	157.05

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
16:40	804.3	554.42	72.26	1.39E+08	214.03	1192.64	224.04	5164.78	3.89	157.13
16:41	803.11	552.86	72.26	1.39E+08	213.02	1187.94	222.93	5139.31	0	157.44
16:42	802.03	558.64	71.28	1.39E+08	213.32	1177.26	220.51	5069.44	0	157.49
16:43	802.53	560.77	70.42	1.38E+08	212.33	1175.27	220.56	5067.31	3.13	157.51
16:44	803.23	557.99	70.42	1.38E+08	215.22	1177.97	220.92	5074.27	3.56	157.56
16:45	804.36	552.44	70.96	1.39E+08	220.71	1178.59	217.14	4999.13	5.3	157.68
16:46	804.56	551.62	71.98	1.39E+08	216.46	1169.93	217.51	5019.86	3.92	157.68
16:47	802.93	555.65	71.98	1.39E+08	213.81	1171.92	218.65	5045.32	2.62	157.77
16:48	802.05	559.19	71.98	1.39E+08	215.1	1174.63	219.17	5057.93	4.64	157.86
16:49	801.41	560.79	71.46	1.39E+08	220.06	1171.92	218.58	5024.2	4.76	157.88
16:50	800.79	556.65	71.4	1.39E+08	222.53	1176.59	220.12	5058.67	3.17	157.93
16:51	797.26	565.65	71.4	1.39E+08	220.36	1179.94	220.14	5058.71	2.94	157.93
16:52	794.12	576.38	72.58	1.40E+08	220.05	1176.6	218.95	5076.77	4.15	157.52
16:53	788.33	574.29	72.68	1.40E+08	222.42	1175.93	217.34	5042.12	5.04	157.47
16:54	799.71	577.3	72.69	1.40E+08	211.29	1158.57	212.25	4926.1	3.22	157.55
16:55	808.24	558.75	72.78	1.40E+08	207.53	1149.87	220.89	5130.31	0	157.78
16:56	811.68	538.46	74.52	1.41E+08	205.57	1180.59	230.64	5409.67	5.4	158.11
16:57	811.44	531.15	74.52	1.41E+08	205.88	1201.99	229.17	5376.83	4.33	158.11
16:58	808.63	536.74	74.13	1.41E+08	209.5	1194.65	223.59	5235.18	5.43	158.12
16:59	806.36	553.57	69.81	1.40E+08	213.48	1173.27	218.39	5083.59	4.03	157.89
17:00	799.33	574.56	69.81	1.40E+08	214.94	1169.93	220.96	5144.07	3.16	157.88
17:01	798.74	584.07	69.81	1.40E+08	213.94	1185.28	227.19	5288.16	2.98	157.85
17:02	800.67	578.74	71.11	1.40E+08	215.96	1202.04	228.17	5320.07	4.65	157.94
17:03	804.54	566.34	73.54	1.41E+08	217.98	1191.94	224.37	5239.31	4.46	158
17:04	807.61	552	73.54	1.41E+08	215.6	1173.26	220.27	5143.65	4.06	158.41
17:05	808.91	542.71	73.5	1.40E+08	214.91	1165.23	215.69	5025.58	5.65	158.45
17:06	808.34	541.14	73.35	1.40E+08	213.82	1149.9	213.7	4963.41	5.12	158.48
17:07	805.17	547.13	73.35	1.40E+08	214.42	1144.56	214.78	4988.99	5.87	158.33
17:08	800.77	557.98	73.36	1.40E+08	214.96	1149.9	218.92	5084.26	5.55	157.92
17:09	799.62	572.52	70.95	1.39E+08	215.24	1172.56	219.36	5075.87	5.34	157.96
17:10	799.63	581.75	68.7	1.39E+08	215.38	1180.59	222.17	5131.17	6.29	157.93
17:11	804.07	577.89	68.7	1.39E+08	216.36	1190.64	223	5149.72	3.76	157.93
17:12	807.27	570.19	70.15	1.39E+08	217.62	1182.59	220.95	5111.46	4.74	158.09
17:13	806.65	556.16	75.92	1.41E+08	216.26	1171.25	218.24	5100.05	5.98	158.49
17:14	808.29	545.89	75.93	1.41E+08	213.17	1168.57	217.16	5076.75	4.93	158.52
17:15	806.72	546.92	75.93	1.41E+08	212.24	1164.56	214.82	5020.73	6.74	158.52
17:16	804.42	557.97	69.8	1.38E+08	212.61	1157.9	214.05	4915.69	4.55	158.25
17:17	801.05	571.4	69.47	1.38E+08	214.21	1151.89	214.22	4917.92	4.18	158.27
17:18	800.03	578.88	69.47	1.38E+08	215.58	1161.21	216.71	4975.24	5.9	158.3
17:19	803.07	574.1	69.47	1.38E+08	214.24	1175.25	218.68	5021.23	4.15	158.35
17:20	807.98	562.66	69.47	1.38E+08	214.02	1179.24	219.2	5032.71	4.9	158.41
17:21	806.21	550.37	69.47	1.38E+08	213.48	1176.59	218.24	5009.75	6.76	158.79

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
17:22	807.94	540.62	69.47	1.38E+08	212.04	1169.93	218.22	5009.61	4.11	158.85
17:23	808.98	544.4	69.47	1.38E+08	212.62	1166.58	215.17	4940.66	2.98	158.91
17:24	807.73	555.15	69.52	1.39E+08	213.23	1160.57	213.4	4908.26	3.4	158.85
17:25	803.25	565.23	69.59	1.39E+08	214.55	1160.57	215.3	4966.44	5.65	158.57
17:26	802.07	572.32	69.59	1.39E+08	211.98	1169.9	221.44	5107.11	4.69	158.62
17:27	802.51	573.48	69.59	1.39E+08	213.02	1183.29	220.94	5091.29	3.53	158.72
17:28	804.23	567.78	72.83	1.37E+08	213.81	1180.59	216.99	4942.33	3.87	158.67
17:29	805.78	559.27	73.26	1.37E+08	214.04	1165.24	215.43	4905.85	6.11	159.17
17:30	809.47	550.92	73.26	1.37E+08	212.58	1152.55	214.27	4880.87	6	159.27
17:31	810.03	553.98	71.74	1.38E+08	210.55	1150.56	214.47	4908.14	5.13	159.4
17:32	806.2	559.27	71.09	1.38E+08	210.47	1161.23	217.55	4990.56	5.73	159.46
17:33	803.28	566.32	71.09	1.38E+08	210.4	1165.88	220.1	5047.79	5.9	159.17
17:34	803.09	571.96	71.1	1.39E+08	213.82	1165.89	219.86	5057.84	5.6	159.37
17:35	804.63	568.86	71.09	1.39E+08	213.78	1168.45	219.96	5080.55	4.32	159.42
17:36	807.78	559.75	71.09	1.39E+08	214.25	1172.05	220.01	5080.55	4.29	159.48
17:37	809	552.09	71.1	1.39E+08	211.51	1167.24	221.29	5110.61	5.96	159.74
17:38	807.4	549.22	73.23	1.39E+08	211.37	1167.3	221.2	5114.84	4.54	159.89
17:39	806.88	549.46	73.6	1.39E+08	211.44	1164.68	218.12	5044.64	4.77	159.86
17:40	804.12	558.63	73.6	1.39E+08	211.54	1157.24	216.75	5012.19	4.67	159.85
17:41	804.73	568.32	72.69	1.39E+08	211.83	1159.11	215.64	4980.05	4.95	159.43
17:42	802.24	575.39	70.18	1.39E+08	212.06	1163.24	213.82	4916.5	4.02	159.46
17:43	802.59	575.41	70.18	1.39E+08	213.39	1164.62	213.38	4907.17	3.24	159.43
17:44	806.32	566.39	70.18	1.39E+08	214.67	1152.04	212.37	4884.21	4.02	159.45
17:45	812.11	561.26	72.68	1.40E+08	214.2	1153.27	210.64	4894.97	5.02	159.53
17:46	810.24	557.99	73.94	1.40E+08	211.13	1150.65	210.1	4892.45	5.14	159.9
17:47	808.57	554.26	73.93	1.40E+08	212.03	1148.69	209.69	4883.11	4.59	159.96
17:48	808.36	558.19	72.96	1.40E+08	212.33	1139.33	207.68	4810.67	3.52	159.93
17:49	807.39	565.71	71.98	1.39E+08	211.96	1139.84	210.23	4859.05	4.08	159.85
17:50	807.88	572.1	71.98	1.39E+08	211.66	1149.23	211.18	4882.24	6.46	159.59
17:51	807.39	572.66	71.98	1.39E+08	212.22	1157.84	211.97	4905.59	9.61	159.72
17:52	808.56	566.87	71.89	1.40E+08	212.3	1158.56	210.9	4911.33	6.86	159.72
17:53	808.43	557.37	71.89	1.40E+08	213.76	1155.23	209.53	4878.73	6.45	159.8
17:54	808.46	555.14	71.89	1.40E+08	208.51	1154.53	210.67	4894.39	7.87	159.83
17:55	804.28	557.48	70.68	1.38E+08	205.49	1153.89	211.78	4857.54	13.19	160.15
17:56	803.98	560.74	70.57	1.38E+08	203.95	1154.57	211.46	4850.69	13.65	160.24
17:57	803.38	563.57	70.57	1.38E+08	201.94	1153.89	211.06	4841.52	11.69	160.29
17:58	807.85	566.82	70.13	1.37E+08	198.71	1158.58	213.64	4866.56	25.88	160.03
17:59	809.19	563.66	69.47	1.37E+08	215.17	1161.23	210.18	4764.6	24.64	159.93
18:00	810.75	552.15	69.47	1.37E+08	216.72	1137.2	207.38	4701.16	8.75	160.08
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Average =	792.6	541.59	68.56	1.35E+08	202.25	1117.75	220.16	4950.53	6.06	148.85

Unit 1 Process Data

Time	LOADMW (MW)	COALFLOW (TPH)	VELOC (FT/SEC)	FLOWSCFH (SCFH)	NOXPPM (PPM)	SO2IN (PPM)	SO2PPM (PPM)	SO2#/HR (LB/HR)	CO (PPM)	TEMPT (DEGF)
Maximum =	812.43	584.07	75.93	1.41E+08	227.83	1206.03	263.04	5987.26	32.34	160.29
Minimum =	672.79	432.16	59.22	1.20E+08	164.46	949.05	157.31	3575.34	0	141.72
Possible Values =	661	661	661	661	661	661	661	661	661	661
Included Values =	661	661	661	661	661	661	661	661	661	661
Total =	523909.31	357991.34	45318.67	8.95E+10	133687.46	738835	145522.94	3272300.4	4005.97	98387.26

APPENDIX D

Ontario Hydro Sampling Method (July 1999 Draft)

July 7, 1999
DRAFT

Standard Test Method for Elemental, Oxidized, Particle-Bound, and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method)[1]

1. Scope

1.1 This method applies to the determination of elemental, oxidized, particle-bound, and total mercury emissions from coal-fired stationary sources.

1.2 This method is applicable to elemental, oxidized, particle-bound, and total mercury concentrations ranging from approximately 0.5 to 100 µg/dscm.

1.3 This method describes equipment and procedures for obtaining samples from effluent ducts and stacks, equipment and procedures for laboratory analysis, and procedures for calculating results.

1.4 This method is applicable for sampling elemental, oxidized, and particle-bound mercury at the inlet and outlet of emission control devices and for calculating control device mercury collection efficiency.

1.5 Method applicability is limited to flue gas stream temperatures within the thermal stability range of the sampling probe and filter components.

1.6 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.7 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.8 This standard assumes users are familiar with EPA stack-gas sampling procedures as stated in EPA Methods 1–4, Method 5, and Method 17.

2. Referenced Documents

2.1 *ASTM Standards:*
D 1193 Specification for Reagent Water[2]

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[1] This test method is under the jurisdiction of ASTM Committee D-22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

[2] *Annual Book of ASTM Standards*, Vol. 11.01.

D1356 Definitions of Terms Relating to Atmospheric Sampling and Analysis[3]
D 2986 Evaluation of Air-Assay Media by the Monodisperse DOP (Dioctyl Phthalate) Smoke Test[3]
D 3154 Test Method for Average Velocity in a Duct (Pitot Tube Method)[3]
D 3685 Particulates Independently or for Particulates and Collected Residue Simultaneously in Stack Gases[3]
E 1 Specification for ASTM Thermometers[4]

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2.2 *Other Standards:*[5]
EPA Method 1 – Sample and Velocity Traverses for Stationary Sources
EPA Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
EPA Method 3 – Gas Analysis for the Determination of Dry Molecular Weight
EPA Method 4 – Determination of Moisture Content in Stack Gases
EPA Method 5 – Determination of Particulate Emissions from Stationary Sources
EPA Method 12 – Determination of Inorganic Lead Emissions from Stationary Sources
EPA Method 17– Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)
EPA Method 29 – Determination of Metals Emissions from Stationary Sources
EPA Method 101A – Determination of Particle-Bound and Gaseous Mercury Emissions from Sewage Sludge Incinerators
EPA Method 301 – Field Validation of Pollutant Measurement Methods from Various Waste Media
EPA SW 846 7470 – Mercury in Liquid Waste – Manual Cold Vapor Technique
EPA Water and Waste 600/4-79-020 – Methods for Chemical Analysis of Water and Wastes

3. Terminology

3.1 Definitions other than those given below in Sections 3.2, 3.3, and 3.4 are listed in ASTM D 1356.

3.2 *Definitions of Terms specific to the standard:*

3.2.1 *elemental mercury*—mercury in its zero oxidation state, Hg^0.

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[3] *Annual Book of ASTM Standards*, Vol. 11.03.

[4] *Annual Book of ASTM Standards, Vol 14.02.*

[5] Available from the U.S. Environmental Protection Agency's Emission Measurement Technical Information Center or Code of Federal Regulations (40 CFR Part 60, Appendix A or 40 CFR Part 61, Appendix B).

3.2.2 *oxidized mercury*—mercury in its mercurous or mercuric oxidation states: Hg_2^{2+} and Hg^{2+}, respectively.

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3.2.3 *elemental mercury catch*—mercury collected in the acidified hydrogen peroxide (HNO_3–H_2O_2) and potassium permanganate (H_2SO_4–$KMnO_4$) impinger solutions employed in this method. This is gaseous Hg^0.

3.2.4 *oxidized mercury* catch—mercury collected in the aqueous potassium chloride (KCl) impinger solution employed in this method. This is gaseous Hg^{2+}.

3.2.5 *particle-bound mercury catch*—mercury associated with the particulate matter collected in the front half of the sampling train.

3.2.6 *front half of the sampling train*—all mercury collected on and upstream of the sample filter.

3.2.7 *total mercury*— all mercury (solid-bound, liquid, or gaseous) however generated or entrained in the flue gas stream (i.e., summation of elemental, oxidized, and particle-bound mercury).

3.3 *Symbols*:

A = cross-sectional area of stack, m^2 (ft^2)
B_{ws} = water vapor in the gas stream, proportion by volume
ΔH = average pressure differential across the orifice meter, kPa (in. H_2O)
Hg_{ash} = concentration of mercury in sample filter ash, µg/g
Hg^{tp} = concentration of particle-bound mercury, µg/dscm
Hg^0 = concentration of elemental mercury, µg/dscm
Hg^{2+} = concentration of oxidized mercury, µg/dscm
IR = instrument reading from mercury analyzer, µg/L
L_p = leakage rate observed during the posttest leak check, m^3/min (cfm)
L_a = maximum acceptable leakage rate
M_s = molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole)
M_w = molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole)
N = Normal conditions, defined as 0°C and 1 atmosphere pressure (in the U.S. N and standard conditions are the same in SI units)
P_{bar} = barometric pressure at the sampling site, kPa (in. Hg)
P_s = absolute stack gas pressure, kPa (in. Hg)
P_{std} = standard absolute pressure, 101.3 kPa (29.92 in. Hg)
R = ideal gas constant, 0.008314 kPa-m^3/K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole)
T_m = absolute average dry gas meter temperature, K (°R)
T_s = absolute stack temperature, K (°R)
T_{std} = standard absolute temperature, 293 K (528°R)
V_D = total digested volume, mL
V_m = volume of gas sample as measured by dry gas meter, dcm (dscf)

$V_{m(std)}$ = volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf)

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$V_{w(std)}$ = volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)

W_{ash} = total mass of ash on sample filter, g

W_{lc} = total weight of liquid collected in impingers and silica gel, g (lb)

Y = dry gas meter calibration factor

θ = total sampling time, min

θ_1 = sampling time interval, from the beginning of a run until the first component change, min

4. Summary of Test Method

4.1 A sample is withdrawn from the flue gas stream isokinetically through a probe/filter system, maintained at 120°C or the flue gas temperature, whichever is greater, followed by a series of impingers in an ice bath. Particle-bound mercury is collected in the front half of the sampling train. Oxidized mercury is collected in impingers containing a chilled aqueous potassium chloride solution. Elemental mercury is collected in subsequent impingers (one impinger containing a chilled aqueous acidic solution of hydrogen peroxide and three impingers containing chilled aqueous acidic solutions of potassium permanganate). Samples are recovered, digested, and then analyzed for mercury using cold-vapor atomic absorption (CVAAS) or fluorescence spectroscopy (CVAFS).

5. Significance and Use

5.1 The measurement of particle-bound, oxidized, elemental, and total mercury in stationary-source flue gases provides data that can be used for dispersion modeling, deposition evaluation, human health and environmental impact assessments, emission reporting, compliance determinations, etc. Particle-bound, oxidized, and elemental mercury measurements before and after control devices may be necessary for optimizing and evaluating the mercury removal efficiency of emission control technologies.

6. Interferences

There are no known interferences, but certain biases may be encountered (See Section 16).

7. Apparatus

7.1 *Sampling Train*—similar to ASTM D 3685, EPA Method 5/EPA Method 17 and EPA Method 29 trains, as illustrated in Fig. 1.

7.1.1 *Probe Nozzle (Probe Tip)*—Glass nozzles are required unless alternate nozzles are constructed of materials that are free from contamination and will not interact with the sample. Probe fittings constructed of polytetrafluoroethylene (PTFE), polypropylene, etc., are required instead of metal fittings to prevent contamination.

7.1.2. *Probe Liner*—If the sample train is to be in EPA Method 5 configuration (out-of-stack filtration), the probe liner must be constructed of quartz or borosilicate glass. If an EPA Method 17 (in-stack filtration) sampling configuration is used, the probe/probe liner may be constructed of borosilicate glass, quartz or, depending on the flue gas temperature, PTFE.

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7.1.3 *Pitot Tube*—Type S pitot tube. Refer to Section 2.2 of EPA Method 2 for a description.

7.1.4 *Differential Pressure Gauges*—inclined manometers or equivalent devices. Refer to Section 2.1 of EPA Method 2 for a description.

7.1.5 *Filter Holder* — constructed of borosilicate glass or PTFE-coated stainless steel with a PTFE filter support or other nonmetallic, noncontaminating support. Do not use a glass frit or stainless steel wire screen. A silicone rubber or PTFE gasket, designed to provide a positive seal against leakage from outside or around the filter, may be used.

7.1.6 *Connecting Umbilical Tube*—heated PTFE tubing. This tube must be heated to a minimum of 120°C to help prevent water and acid condensation. (The umbilical tube is defined as any tubing longer than 0.5 m that connects the filter holder to the impinger train).

7.1.7 *Probe and Filter Heating System*

7.1.7.1 *EPA Method 5 Configuration*—For EPA Method 5 configuration, the temperature of the flue gas, sample probe, and the exit of the sample filter must be monitored using temperature sensors capable of measuring temperature to within 3°C (5.4°F). The heating system must be capable of maintaining the sample gas temperature of the probe and exit of the sample filter to within ±15°C (±27°F) of the flue gas temperature. Regardless of the flue gas temperature, to prevent water and acid condensation, at no time must the probe temperature, sample filter exit gas temperature, or the temperature of the connecting umbilical cord be less than 120°C.

7.1.7.2 *EPA Method 17 Configuration*—For EPA Method 17 configuration, the sample filter is located in the duct and, therefore, naturally maintained at the flue gas temperature. The heating system is only required to maintain the probe and connecting umbilical cord to at least 120°C. If the flue gas temperature is less than 120°C, then EPA Method 5 configuration must be used.

7.1.8 *Condensing/Absorbing System*—consists of eight impingers immersed in an ice bath and connected in series with leak-free ground glass fittings or other noncontaminating leak-free fittings. (At no time is silicon grease or other greases to be used for this method). The first, second, fourth, fifth, sixth, and eighth impingers are of the Greenburg–Smith design modified by replacing the standard tip with a 1.3-cm (0.5-in.)-ID straight glass tube extending to about 1.3 cm (0.5 in.) from the bottom of the flask. The third and seventh impingers are also Greenburg–Smith design, but with the standard tip including the glass impinging plate. The first, second, and third impingers contain aqueous 1 N potassium chloride (KCl) solution. The fourth impinger contains

an aqueous solution of 5%$^{v}/_{v}$ nitric acid (HNO_3) and 10% $^{v}/_{v}$ hydrogen peroxide (H_2O_2). The fifth, sixth, and seventh impingers contain an aqueous solution of 4%$^{w}/_{v}$ potassium permanganate ($KMnO_4$) and 10%$^{v}/_{v}$ sulfuric acid (H_2SO_4). The last impinger contains silica gel or an equivalent desiccant. Refer to Note 1.

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Note 1—When flue gas streams are sampled with high moisture content (>20%), additional steps must be taken to eliminate carryover of impinger contents from one sample type to the next. These steps must include use of oversized impinger(s) or use of an empty impinger between the KCl and HNO_3–H_2O_2. If a dry impinger is used, it must be rinsed as discussed in Section 13.2 of this method and the rinse added to the preceding impinger.

7.1.9 *Metering System*—vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3°C (5.4°F), and a dry gas meter or controlled orifice capable of measuring volume to within 2%.

7.1.10 *Barometer*— barometer capable of measuring atmospheric pressure to within 0.33 kPa (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case, the station value (which is the absolute barometric pressure) shall be requested. An adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of negative 0.33 kPa (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

7.1.11 *Gas Density Determination Equipment*—temperature sensor and pressure gauge, as described in Section 2.3 and 2.4 of EPA Method 2. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the sensor tip extends beyond the leading edge of the probe sheath and does not touch any metal. Alternative temperature sensor configurations are described in Section 2.1.10 of EPA Method 5. If necessary, a gas analyzer can be used to determine dry molecule weight of the gas (refer to EPA Method 3).

7.2 *Digestion Apparatus*

7.2.1 *Dry Block Heater or Hot Water Bath*—a heater capable of maintaining a temperature of 95°C is required for digestion of samples, similar to that described in EPA SW846 Method 7470.

7.2.2 *Ice Bath*

7.2.3 *Digestion Flasks*—Use 50- to 70-mL tubes or flasks with screw caps that will fit a dry block heater. For a water bath, 300-mL biological oxygen demand bottles for SW846 Method 7470 are to be used. In addition, borosilicate glass test tubes, 35- to 50-mL volume, with rack are needed.

7.2.4 *Microwave or Convection Oven and PTFE Digestion Vessels*—120 mL, or equivalent digestion vessels with caps equipped with pressure relief valves for the dissolution of

ash, along with a capping station or the equivalent to seal the digestion vessel caps. Use a vented microwave or convection oven for heating. In addition, polymethylpentene (PMP) or equivalent volumetric flasks are recommended for the digested ash solutions.

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7.3 *Analytical Equipment*—dedicated mercury analyzer or equivalent apparatus for the analysis of mercury via CVAAS. Alternatively, CVAFS may be used. CVAAS is a method based on the absorption of radiation at 253.7 nm by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrometer. Absorbency is measured as a function of mercury concentration. A soda-lime trap and a magnesium perchlorate trap must be used to precondition the gas before it enters the absorption cell.

8. Reagents and Materials

8.1 *Purity of Reagents*—Reagent-grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.[6] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

8.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type II in ASTM Specification D 1193.

8.3 *Reagents:*

8.3.1 *Boric Acid (H_3BO_3)*—purified reagent grade.

8.3.2 *Hydrochloric Acid (HCl)*—trace metal-grade concentrated hydrochloric acid, with a specific gravity of 1.18.

8.3.3 *Hydrofluoric Acid (HF)*—concentrated hydrofluoric acid, 48%–50%.

8.3.4 *Hydrogen Peroxide (H_2O_2)*—30%$^{v}/_{v}$ hydrogen peroxide.

8.3.5 *Hydroxylamine Sulfate ($NH_2OH \cdot H_2SO_4$)*—solid.

8.3.6 *Sodium Chloride*—solid.

8.3.7 *Mercury Standard Solution*—a certified (1000 µg/mL) mercury standard.

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[6] "Reagent Chemicals, American Chemical Society Specifications," Am. Chemical Soc., Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, NY, and the "United States Pharmacopeia."

8.3.7 *Nitric Acid (HNO_3)*—trace metal-grade concentrated nitric acid with a specific gravity of 1.42.

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8.3.8 *Potassium Chloride (KCl)*—solid.

8.3.9 *Potassium Permanganate ($KMnO_4$)*—solid.

8.3.10 *Potassium Persulfate ($K_2S_2O_8$)*—solid.

8.3.11 *Stannous Chloride ($SnCl_2 \cdot 2H_2O$)*—solid.

8.3.12 *Sulfuric Acid (H_2SO_4)*—trace metal-grade concentrated sulfuric acid, with a specific gravity of 1.84.

8.4 *Materials:*

8.4.1 *Indicating Silica Gel*—with a size of 6–16 mesh.

8.4.2 *Crushed or Cubed Ice.*

8.4.3 *Sample Filters*—quartz fiber filters, without organic binders, exhibiting at least 99.95% efficiency (<0.05% penetration) for 0.3-µm dioctyl phthalate smoke particles and containing less than 0.2 $\mu g/m^2$ of mercury. Test data provided by filter manufacturers and suppliers stating filter efficiency and mercury content are acceptable. However, if no such results are available, determine filter efficiency using ASTM Test Method D 2986, and analyze filter blanks for mercury prior to emission testing. Filter material must be unreactive to sulfur dioxide (SO_2) or sulfur trioxide (SO_3).[7]

8.4.4 *Filter Papers*—for filtration of digested samples. The filter paper must have a particle retention of >20 µm and filtration speed of >12 sec.

8.4.5 *Nitrogen Gas (N_2)*—carrier gas of at least 99.998% purity. Alternatively, argon gas may be used.

8.4.6 *Soda Lime*—indicating 4- to 8-mesh absorbent for trapping carbon dioxide.

8.4.7 *Sample Containers*—glass with PTFE-lined lids.

8.5 *Sampling Reagents*

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[7] Felix, L.G.; Clinard, G.I.; Lacey, G.E.; McCain, J.D. "Inertial Cascade Impactor Substrate Media for Flue Gas Sampling," U.S. Environmental Protection Agency, Research Triangle Park, NC 27711, Publication No. EPA-600/7-77-060; June 1977, 83 p.

8.5.1 *KCl Absorbing Solution* (1 mol/L)—Dissolve 74.56 g of KCl in 500 mL of reagent water in a 1000-mL volumetric flask, swirl to mix, and dilute to volume with water. Mix well. A new batch of solution must made prior to each field test.

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8.5.2 *HNO_3–H_2O_2 Absorbing Solution* (5%$^V/_V$ HNO_3, 10%$^V/_V$ H_2O_2)—Add slowly, with stirring, 50 mL of concentrated HNO_3 to a 1000-mL volumetric flask containing approximately 500 mL of water, and then add carefully, with stirring, 333 mL of 30%$^V/_V$ H_2O_2. Dilute to volume with water. Mix well. A new batch of solution must made prior to each field test.

8.5.3 H_2SO_4-*$KMnO_4$ Absorbing Solution* (4%$^W/_V$ $KMnO_4$, 10%$^V/_V$ H_2SO_4)—Mix carefully, with stirring, 100 mL of concentrated H_2SO_4 into approximately 800 mL of water. When mixing, be sure to follow standard acid to water addition procedures and safety precautions associated with strong acids. Then add water, with stirring, to make 1 L. This solution is 10%$^V/_V$ H_2SO_4. Dissolve, with stirring, 40 g of $KMnO_4$ into 10%$^V/_V$ H_2SO_4, and add 10%$^V/_V$ H_2SO_4, with stirring, to make 1 L. (**Warning**—See 9.1.1). H_2SO_4–$KMnO_4$ absorbing Solution must be made daily.

8.6 *Rinse Solutions for Sample Train*

8.6.1 *0.1 N HNO_3 Solution*—A certified reagent grade 0.1 N HNO_3 solution can be purchased directly or can be made by slowly adding 12.5 mL of concentrated HNO_3 to a 2000-mL volumetric flask containing approximately 500 mL of water, then diluting with water to volume.

8.6.2 *10%% $^W/_V$ HNO_3 Solution*—Mix carefully, with stirring, 100 mL of concentrated HNO_3 into approximately 800 mL of water. When mixing, be sure to follow standard acid to water addition procedures and safety precautions associated with strong acids. Then add water, with stirring, to make 1 L.

8.6.3 *10% $^W/_V$ Hydroxylamine solution*—Add 100 g Hydroxylamine sulfate and 100 grams sodium chloride to a 1000-mL volumetric flask containing approximately 500 mL of water. After the Hydroxylamine sulfate and sodium chloride has been dissolved, dilute with water to volume.

8.7 *Sample Digestion Reagents*:

8.7.1 *Boric Acid Solution (4%$^W/_V$)*—Dissolve 4 g H_3BO_3 in water, and dilute to 100 mL.

8.7.2 *Aqua Regia (HCl:HNO_3 3:1)*—Add 3 parts concentrated HCl to 1 part concentrated HNO_3. Note that this should be made up in advance and allowed to form a dark orange color. This mixture should be loosely capped, as pressure will build as gases form.

8.7.3 *Saturated Potassium Permanganate Solution (5%$^W/_V$)*—Mix 5 g $KMnO_4$ into water, dilute to 100 mL, and stir vigorously.

8.7.4 *Potassium Persulfate Solution (5%$^{w}/_{v}$)*—Dissolve 5 g $K_2S_2O_8$ in water, and dilute to 100 mL.

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8.8 *Analytical Reagents*:

8.8.1 *Hydrochloric Acid Solution (10%$^{v}/_{v}$)*—Add 100 mL concentrated HCl to water, and dilute to 1 L. Be sure to follow all safety precautions for using strong acids.

8.8.2 *Stannous Chloride Solution (10%$^{w}/_{v}$)*–Dissolve 100 g in 10%$^{v}/_{v}$ HCl, and dilute with 10%$^{v}/_{v}$ HCl to 1 L. Difficulty in dissolving the stannous chloride can be overcome by dissolving in a more concentrated HCl solution (such as 100 mL of 50%$^{v}/_{v}$ HCl) and diluting to 1 L with water. Note that care must be taken when adding water to a strong acid solution. Add a lump of mossy tin (~0.5 g) to this solution.

8.9 *Mercury Standards*:

8.9.1 *10 mg/L Hg Stock Solution*—Dilute 1 mL of 1000 mg/L Hg standard solution to 100 mL with 10%$^{v}/_{v}$ HCl.

8.9.2 *100 µg/L Hg Stock Solution*—Dilute 1 mL of 10 mg/L Hg stock solution to 100 mL with 10%$^{v}/_{v}$ HCl.

8.9.3 *Working Hg Standards*—Prepare working standards of 1.0, 5.0, 10.0, and 20.0 µg/L Hg from the 100-µg/L stock solution by diluting 1, 5, 10, and 20 mL each to 100 mL with 10%$^{v}/_{v}$ HCl.

Note 1—If samples to be analyzed are less than 1.0 µg/L Hg, working standards should be prepared at 0.05, 0.1, 0.5, and 1.0 µg/L Hg from a 10-µg/L Hg standard solution.

8.9.4 *Quality Control Standard (QC)*—A quality control standard is prepared from a separate Hg standard solution. The QC standard should be prepared at a concentration of approximately one-half the calibration range.

8.10 *Glassware Cleaning Reagents*—Prior to any fieldwork, all glassware should be cleaned according to the guidelines outlined in EPA Method 29, section 5.1.1

9. Hazards

9.1 *Warning*:

9.1.1 Pressure may build up in the solution storage bottle because of a potential reaction between potassium permanganate and acid. Therefore, these bottles should not be fully filled and should be vented to relieve excess pressure and prevent explosion. Venting must be in a manner that will not allow contamination of the solution.

9.1.2 Hazards to personnel exist in the operation of the cold-vapor atomic absorption spectrophotometer. Refer to the manufacturer's instruction manual before operating the instrument.

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9.1.3 Sample digestion with hot concentrated acids creates a safety problem. Observe appropriate laboratory procedures for working with concentrated acids.

9.2 *Precaution:*

9.2.1 The determination of microquantities of mercury species requires meticulous attention to detail. Good precision is generally unattainable without a high level of experience with stack-sampling procedures. Precision may be improved by knowledge of, and close adherence to, the suggestions that follow.

9.2.1.1 All glassware used in the method must be cleaned thoroughly prior to use in the field, as described in Section 8.10 of this method.

9.2.1.2 Use the same reagents and solutions in the same quantities for a group of determinations and the corresponding solution blank. When a new reagent is prepared or a new stock of filters is used, a new blank must taken and analyzed.

10. Sampling

10.1 *Preparation for Test:*

10.1.1 *Preliminary Stack Measurements*—Select the sampling site, and determine the number of sampling points, stack pressure, temperature, moisture, dry molecular weight, and range of velocity head in accordance with procedures of ASTM Test Method D 3154 or EPA Methods 1 through 4.

10.1.2 Select the correct nozzle diameter to maintain isokinetic sampling rates based on the range of velocity heads determined in 10.1.1.

10.1.3 Ensure that the proper differential pressure gauge is selected for the range of velocity heads (refer to EPA Method 2, Section 2.2).

10.1.4 It is suggested that an EPA Method 17 configuration be used; however, if an EPA Method 5 setup is to be used, then select a suitable probe length such that all traverse points can be sampled. Consider sampling from opposite sides of the stack to minimize probe length when a large duct or stack is sampled.

10.1.5 *Sampling Time and Volume*—The total sampling time for this method should be at least 2 but not more than 3 hours. Use a nozzle size that will guarantee an isokinetic gas sample volume between 1.0 dry cubic meters corrected to standard conditions (dscm) and 2.5 dscm. If traverse sampling is done (necessary for sampling at electric utilities), use the same points for

sampling that were used for the velocity traverse as stated in Section 10.1.1 of this method. Each traverse point must be sampled for a minimum of 5 minutes.

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11. Preparation of Apparatus

11.1 *Pretest Preparation:*

11.1.1 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record the total weight of the silica gel plus container on each container. Alternatively, the silica gel can be weighed directly in the impinger immediately prior to the train being assembled.

11.1.2 Desiccate the sample filters at 20° ± 5.6°C (68° ± 10°F) and ambient pressure for 24 to 36 hours, weigh at intervals of at least 6 hours to a constant weight (i.e., <0.5-mg change from previous weighing), and record results to the nearest 0.1 mg. Alternatively, the filters may be oven-dried at 105°C (220°F) for 2 to 3 hours, desiccated for 2 hours, and weighed.

11.1.3 Clean all sampling train glassware as described in Section 8.10 before each series of tests at a single source. Until the sampling train is assembled for sampling, cover all glassware openings where contamination can occur.

11.2 *Preparation of Sampling Train:*

11.2.1 Assemble the sampling train as shown in Figure 1.

11.2.2 Place 100 mL of the KCl solution (see Section 8.5.1 of this method) in each of the first, second, and third impingers, as indicated in Figure 1.

11.2.3 Place 100 mL of the HNO_3–H_2O_2 solution (Section 8.5.2 of this method) in the fourth impinger, as indicated in Figure 1.

11.2.4 Place 100 mL of the H_2SO_4–$KMnO_4$ absorbing solution (see Section 8.5.3 of this method) in each of the fifth, sixth, and seventh impingers, as indicated in Figure 1.

11.2.5 Transfer approximately 200 to 300 g of silica gel from its container to the last impinger, as indicated in Figure 1.

11.2.6 Prior to final train assembly, weigh and record the weight of each impinger. This information is required to calculate the moisture content of the sampled flue gas.

11.2.7 To ensure leak-free sampling train connections and to prevent possible sample contamination problems, use PTFE tape, PTFE-coated O-rings, or other noncontaminating material.

11.2.8 Place a weighed filter in the filter holder using a tweezer or clean disposable surgical gloves.

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11.2.9 Install the selected nozzle using a noncontaminating rubber-type O-ring or equivalent when stack temperatures are less than 260°C (500°F) and an alternative gasket material when temperatures are higher. Other connecting systems, such as PTFE ferrules or ground glass joints, may also be used on the probe and nozzle.

11.2.10 Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

11.2.11 Place crushed or cubed ice around the impingers.

11.2.12 *Leak-Check Procedures.* Follow the leak-check procedures given in Section 4.1.4.1 (Pretest Leak Check), Section 4.1.4.2 (Leak Checks During the Sample Run), and Section 4.1.4.3 (Posttest Leak Checks) of EPA Method 5 or 17.

Note 2—If the flue gas temperature at the sampling location is greater than 260°C (above the temperature where PTFE or rubber-type seals can be used), the posttest leak check is determined beginning at the front end of the probe (does not include nozzle or sample filter holder for EPA Method 17).

12. Calibration and Standardization

12.1 *Sampling Train Calibration:*

12.1.1 *Probe Nozzle*—Refer to Sections 2.1.1 of either EPA Method 5 or 17.

12.1.2 *Pitot Tube*—Refer to Section 4 of EPA Method 2.

12.1.3 *Metering System*—Refer to Section 5.3 of either EPA Method 5 or 17.

12.1.4 *Probe Heater*—Refer to Section 7.1.7.1 and 7.1.7.2 of this method.

12.1.5 *Temperature Gauges*— Refer to Section 4.3 of EPA Method 2.

12.1.6 *Leak Check of the Metering System*—Refer to Section 5.6 of EPA Method 5 or Section 5.5 of EPA Method 17.

12.1.7 *Barometer*—Calibrate the barometer to be used against a mercury barometer.

12.2 *Atomic Absorption or Atomic Fluorescence Spectrometer Calibration*—Perform instrument setup and optimization according to the manufacturer's specifications. Cold-vapor generation of mercury is performed via addition of stannous chloride solution to reduce oxidized mercury to its elemental state. The mercury-laden solution is then purged with a carrier gas into

the atomic absorption cell. This procedure is used to calibrate the instrument using 10%$^{v}/_{v}$ HCl as the blank along with the standards described in Section 8.9.3. Calibration is verified by analyzing the QC standard prepared according to Section 8.9.4 of this method.

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13. Procedures

13.1 *Sampling Train Operation:*

13.1.1 Maintain an isokinetic sampling rate within 10% of true isokinetic. For an EPA Method 5 configuration, maintain sample filter exit gas stream temperatures and probe within ±15°C of the flue gas temperature at the sampling location. However, at no time, regardless of the sample configuration, must the sample filter, probe, or connecting umbilical cord temperature be lower than 120°C.

13.1.2 Record the data, as indicated in Figure 2, at least once at each sample point but not less than once every 5 minutes.

13.1.3 Record the dry gas meter reading at the beginning of a sampling run, the beginning and end of each sampling time increment, before and after each leak check, and when sampling is halted.

13.1.4 Level and zero the manometer. Periodically check the manometer level and zero, because it may drift during the test period.

13.1.5 Clean the port holes prior to the sampling run.

13.1.6 Remove the nozzle cap. Verify that the filter and probe heating systems are up to temperature and that the pitot tube and probe are properly positioned.

Note 3—For an EPA Method 5 configuration, prior to starting the gas flow through the system, the sample filter exit gas temperature may not be at the hot box temperature. However, if the system is set up correctly, once flow is established, the sample filter exit gas temperature will quickly come to equilibrium.

13.1.7 Start the pump. Position the nozzle at the first traverse point with the nozzle tip pointing in the direction of flow. Seal the openings around the probe and port hole to prevent unrepresentative dilution of the gas stream. Read the pitot tube manometer, start the stopwatch, open and adjust the control value until the isokinetic sampling rate is obtained (refer to Section 4.1.5 from either EPA Method 5 or 17 for information on isokinetic sampling rate computations), and maintain the isokinetic rate at all points throughout the sampling period.

13.1.8 When sampling at one traverse point has been completed, move the probe to the next traverse point as quickly as possible. Close the coarse adjust valve, and shut the pump off when transferring the probe from one sample port to another. Exclude the time required to transfer the probe from one port to another from the total sampling time.

13.1.9 Traverse the stack cross section, as required by EPA Method 1.

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13.1.10 During sampling, periodically check and, if necessary, adjust the probe and filter exit sample gas temperatures, as well as the zero of the manometer.

13.1.11 Add more ice, if necessary, to maintain a temperature of <20°C (68°F) at the condenser/silica gel outlet.

13.1.12 Replace the filter assembly if the pressure drop across the filter becomes such that maintaining isokinetic sampling is no longer possible. Conduct a leak check (refer to EPA Method 5 or 17, Section 4.1.4.2) before installing a new filter assembly. The total particulate weight and determination of particle-bound mercury includes all filter assembly catches.

13.1.13 In the unlikely event depletion of $KMnO_4$ via reduction reactions with flue gas constituents other than elemental mercury occurs, it may render it impossible to sample for the desired minimum time. This problem is indicated by the complete bleaching of the purple color of the acidified permanganate solution. If the purple color is lost in the first two H_2SO_4–$KMnO_4$ impingers, then the sample must be repeated. If the gas stream is known to contain large amounts of reducing constituents (i.e., >2500 ppm SO_2) or breakthrough has occurred in previous sampling runs, then the following modification is suggested: the amount of HNO_3–H_2O_2 (10%$^v/_v$) in the fourth impinger should be doubled, and/or a second HNO_3–H_2O_2 impinger should be used to increase the oxidation capacity for reducing gas components prior to the H_2SO_4–$KMnO_4$ impingers.

13.1.14 Use a single train for the entire sample run, except when simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct or when equipment failure necessitates a change of trains.

13.1.15 At the end of a sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, record the final dry gas meter reading, and conduct a posttest leak check, as described in Section 4.1.4.3 of EPA Method 5. Also, leak-check the Pitot lines as described in EPA Method 2, Section 3.1. The lines must pass the leak check to validate the velocity head data.

13.1.16 Calculate percent isokinetic to determine whether the run was valid or another test run should be performed (refer to EPA Method 5 or 17).

13.2 *Sample Recovery:*

13.2.1 Allow the probe to cool before proceeding with sample recovery. When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle, and place a rinsed, noncontaminating cap over the probe nozzle to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling; a vacuum can form in the filter holder, with the undesired result of drawing liquid from the impingers onto the filter.

13.2.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train, and cap the open outlet. Be careful not to lose any condensate that may be present. Cap the filter inlet where the probe was fastened. Remove the umbilical cord from the last impinger, and cap the impinger. Cap the filter holder outlet and impinger inlet. Use noncontaminating caps, such as ground-glass stoppers, plastic caps, serum caps, or PTFE tape, to close these openings.

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13.2.3 Alternatively, the following procedure may be used to disassemble the train before the probe and filter holder/oven are completely cooled. Initially disconnect the filter holder outlet/impinger inlet, and loosely cap the open ends. Then disconnect the probe from the filter holder or cyclone inlet, and loosely cap the open ends. Cap the probe tip, and remove the umbilical cord as previously described.

13.2.4 Transfer the probe and filter–impinger assembly to a clean area that is protected from the wind and other potential causes of contamination or loss of sample. Inspect the train before and during disassembly, and note any abnormal conditions.

13.2.5 The impinger train sample recovery scheme is illustrated in Figure 3.

13.2.6 *Container 1 (Sample Filter)*—Carefully remove the sample filter from the filter holder so as not to lose any ash, weigh filter and ash, and place the filter in a labeled petri dish container. To handle the filter, use either acid-washed polypropylene or PTFE-coated tweezers or clean, disposable surgical gloves rinsed with water and dried. If it is necessary to fold the filter, make certain the particulate cake is inside the fold. Transfer any particulate matter or filter fibers that adhere to the filter holder gasket to the filter in the petri dish. A dry (acid-cleaned) nonmetallic bristle brush should be used to remove any remaining particulate matter. Do not use any metal-containing materials when recovering this train. Immediately cover and seal the labeled petri dish.

13.2.7 *Container 2/2a (All Rinses in Front of the Sample Filter)*

13.2.7.1 *Case 1: Includes Gravimetric Particulate Determination in Addition to Mercury*

Quantitatively recover particulate matter and any condensate from all components prior to the sample filter. A nonmetallic brush may be used for removing particulate matter. All front-half components (all components prior to the sample filter) are then rinsed with acetone as outlined in EPA Method 5 or 17. The acetone rinse is then placed into a container (Container 2a) for which the tare weight has been recorded. Container 2a, with a ribbed watch glass over the top, is placed in a fume hood until the acetone has completely evaporated. After the front-half components have been rinsed with acetone, then rinse these components with 0.1 N HNO_3. The 0.1 N HNO_3 rinse is placed in Container 2.

13.2.7.2 *Case 2: Mercury Determination Only (No Acetone Rinse)*

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Quantitatively recover particulate matter and any condensate from all components prior to the sample filter. A nonmetallic brush may be used for removing particulate matter. The front-half components are then rinsed with 0.1 N HNO_3, and this rinse is placed in Container 2.

13.2.8 *Container 3 (Impingers 1 through 3, KCl Impinger Contents and Rinses):*

13.2.8.1 Dry the exterior surfaces of Impingers 1, 2, and 3. Then weigh and record the weight of each impinger (to the nearest 0.5 g).

13.2.8.2 Clean the filter support, the back half of the filter housing, and connecting glassware by thoroughly rinsing with 0.1 N HNO_3. Pour the rinse into a glass sample Container 3.

13.2.8.3 Add a 5% $^{W}/_{V}$ $KMnO_4$ solution to each impinger until a purple color remains.

13.2.8.4 Pour all of the liquid from the three KCl impingers into Container 3.

13.2.8.5 Rinse the impingers and connecting glassware with 10% $^{V}/_{V}$ HNO_3. Although unlikely, if deposits remain on the impinger surfaces, remove them by doing another 10% $^{V}/_{V}$ HNO_3 rinse that has a very small amount (several drops) of 10% $^{W}/_{V}$ hydroxylamine solution added to the HNO_3 rinse solution. Rinse each of the KCl impingers with this solution until the brown stains are removed. Add these rinses to Container 3. If the solution in Container 3 becomes clear, add a small amount of the 5% $^{W}/_{V}$ $KMnO_4$ solution until a pink or slightly purple color is obtained. Check again after 90 min to ensure the purple color remains.

13.2.8.6 Perform a final rinse of the impingers and connecting glassware with 0.1 N HNO_3, and add to Container 3.

13.2.8.7 Do a final rinse of all glass components with water which is discarded.

13.2.8.8 Mark the height of the fluid level in Container 3, seal, and clearly label the contents.

13.2.9 *Container 4 (Impinger 4, HNO_3–H_2O_2 Impinger Contents and Rinses):*

13.2.9.1 Dry the exterior surfaces of Impinger 4. Then weigh and record the weight of this impinger (to the nearest 0.5 g).

13.2.9.1 Pour the HNO_3–H_2O_2 absorbing solution into sample Container 4.

13.2.9.2 Rinse the H_2O_2–HNO_3 impinger and connecting glassware a minimum of two times with 0.1 N HNO_3, and pour the rinses into Container 4. Do a final rinse with water and discard water.

13.2.10 *Container 5 (Impingers 5 through 7, H_2SO_4–$KMnO_4$ Impinger Contents and Rinses):*

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13.2.10.1 Dry the exterior surfaces of Impingers 5, 6, and 7. Then weigh and record the weight of each impinger (to the nearest 0.5 g).

13.2.10.2 Pour all of the liquid from the three H_2SO_4–$KMnO_4$ impingers into a glass sample Container 5.

13.2.10.3 Rinse the H_2SO_4–$KMnO_4$ impingers and connecting glassware a minimum of two times with 0.1 N HNO_3, and pour the rinses into Container 5. If deposits remain on the impinger surfaces, after the two rinses, remove them by doing a third rinse with 0.1 N HNO_3 and several drops of 10%$^{W}/_{V}$ hydroxylamine solution. On a drop by drop basis add more hydroxylamine solution to the HNO_3 rinse solution. Rinse each of the H_2SO_4–$KMnO_4$ impingers with this solution until the brown stains are removed. Add these rinses to Container 5. If the solution in Container 5 becomes clear, add small amounts of H_2SO_4–$KMnO_4$ solution until a pink or slightly purple color is obtained.

13.2.10.4 Perform a final 0.1 N HNO_3 rinse of the impingers and connecting glassware follow by a water rinse. The 0.1 N HNO_3 rinse is added to Container 5, and the water rinse is discarded.

13.2.10.5 Mark the height of the fluid level, seal the container, and clearly label the contents.

Note 4—As stated earlier in the warning in Section 9.1.1, pressure can build up in the sample storage flask because of the potential reaction of $KMnO_4$ with acid. Do not fill the container completely, and take precautions to relieve excess pressure.

13.2.11 *Container 6 (Impinger 8, Silica Gel Impinger Contents):*

13.2.11.1 Dry the exterior surfaces of Impinger 8. Then weigh and record the weight of this impinger (to the nearest 0.5 g).

13.2.11.2 Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. If spent, the silica gel must be either regenerated or disposed of.

13.2.12 *Solution Blanks (Containers 7–11)*

Solution blanks are taken each time new reagents are prepared. *Note:* The amount of solution collected for the blanks stated below is a suggested volume.

13.2.12.1 *Container 7 (0.1 N HNO_3 Blank)*—Place 50 mL of the 0.1 N HNO_3 solution used in the sample recovery process into a properly labeled container. Seal the container.

13.2.12.2 *Container 8 (1 N KCl Blank)*—Place 50 mL of the 1 N KCl solution used as the impinger solution into a properly labeled container. Seal the container. DRAFT

13.2.12.3 *Container 9 (5%$^{V}/_{V}$ HNO_3–10%$^{V}/_{V}$ H_2O_2 Blank)*—Place 50 mL of the HNO_3–H_2O_2 solution used as the nitric acid impinger reagent into a properly labeled container. Seal the container.

13.2.12.4 *Container 10 (H_2SO_4–$KMnO_4$ Blank)*—Place 50 mL of the H_2SO_4–$KMnO_4$ solution used as the impinger solution in the sample recovery process into a properly labeled container. Refer to **Note 4** in Section 13.2.10.5 of this method.

13.2.12.5 *Container 11 (10% $^{W}/_{V}$ Hydroxylamine Sulfate/Sodium Chloride Blank)*—Place 100 mL of hydroxylamine solution into a properly labeled sample container. Seal the container.

13.2.13 *Container 12 (Sample Filter Blank)*—Once during each field test, place into a properly labeled petri dish three unused blank filters from the same lot as the sampling filters. Seal the petri dish.

13.2.14 After all of the samples have been recovered, they must be analyzed within 45 days.

13.2.15 After all impingers and connectors have been properly rinsed and the solutions recovered, the glassware should be cleaned according to the procedures in Section 8.10 or triple-rinsed with 10%$^{V}/_{V}$ HNO_3 followed by a rinsing with water. If a new source is to be sampled or if there are any brown stains on the glassware, then the glassware must be cleaned according to procedures in Section 8.10 of this method. If multiple sites are to sampled during a single mobilization, an exception to this procedure will be allowed. In this case, a triple rinsing of the glassware with 10%$^{V}/_{V}$ HNO_3 solution followed by a water rinse prior to sampling can be used as an alternative to the procedures in Section 8.10. However, if there are any brown stains on the glassware, then the glassware must be cleaned according to procedures in Section 8.10 of this method.

13.3 *Sample Preparation:*

13.3.1 *Ash Sample (Containers 1 and 2)*

13.3.1.1 *Case 1: Includes Gravimetric Particulate Determination in Addition to Mercury*—The gravimetric particulate loading is determined from the mass of the ash on the filter (Container 1) and the residual particulate from the acetone rinse (Container 2a), as outlined in EPA Method 5 or 17. If a large amount of ash is on the filter, carefully remove the ash to create a raw ash sample from which a representative weighed aliquot can be taken for digestion. If the mass of ash collected on the filter is small (less than 0.5 g), digest the entire filter along with the ash. Dissolve the residual particulate from Container 2a using concentrated HNO_3. This solution is then added to Container 2 (0.1 N HNO_3 probe rinse). The ash material from Container 1 is then

digested using the procedures described in Section 13.3.2 of this method. The same procedure is used to determine the mercury on the sample filter blank.

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Use a modification of EPA SW 846 7470 to digest the sample in Container 2 prior to analysis. The main modification is that the volumes of reagents and sample have been reduced tenfold to reduce waste. This reduction in reagent volume is acceptable because modern dedicated mercury analyzers do not require the large volumes that previous manual methods required. Transfer a 10-mL aliquot of the sample to a digestion tube with a screw cap.

13.3.1.2 *Case 2: Mercury Determination Only*—The same procedures are followed as described previously in Section 13.3.1.1 with the exception that there is no Container 2a.

13.3.2 *Ash Digestion*—Accomplish the complete dissolution of ash by one of the following methods or an equivalent alternative method. The following methods are for the dissolution of inorganic samples, such as ash or sediments, when an analysis of trace elements including mercury is done.

13.3.2.1 *Microwave Digestion*—The use of this method assumes proper training in microwave digestion techniques. In addition, this method is tailored for a CEM (continuous emission monitor) microwave digestion system. A 0.5-g ash sample, accurately weighed to 0.0001 g, is placed in a PTFE microwave digestion vessel with 3 mL of concentrated HF, 3 mL of concentrated HNO_3, and 3 mL of concentrated HCl. The vessel is sealed and placed in the microwave (along with other vessels). The vessels are slowly heated to a pressure of 347 kPa (50 psi), which is held for 5 minutes, followed by heating to a pressure of 550 kPa (80 psi), which is held for 20 minutes. The vessels are allowed to cool to room temperature before venting. 15 mL of 4%$^{w}/_{v}$ boric acid is added to each vessel. The vessels are sealed and placed in the microwave again. The vessels are slowly heated back to a pressure of 347 kPa (50 psi) and held for 10 minutes. The vessels are again allowed to cool to room temperature before venting. The contents of each vessel are quantitatively transferred to a 50-mL PMP or polypropylene (PP) volumetric flask and diluted; note that care must be taken in adding water to a strong acid solution.

13.3.2.2 *Conventional Digestion*—The use of this method assumes proper training in PTFE bomb digestion techniques. Place a 0.5-g ash sample, accurately weighed to 0.0001 g, in a PTFE digestion vessel with 7 mL of concentrated HF and 5 mL of aqua regia. Seal the vessel, and place it in an oven or water bath at 90°C for a minimum of 8 hours (these may be heated overnight). Cool the vessel to room temperature before venting. Add 3.5 g of boric acid and 40 mL of water to each vessel. Seal the vessels, and place them in the oven or water bath for an additional 1 hour. Cool the vessels again to room temperature before venting. Quantitatively transfer the contents of each vessel to a 100-mL PMP, PP, or glass volumetric flask and dilute. Note that care must be taken in adding water to a strong acid solution.

13.3.3 *Preparation of Aqueous KCl Impinger Solution (Containers 3 and 8)*—Dilute sample in a 500-mL volumetric flask to volume with water, and mix. Use a modification of EPA SW 846 7470 to digest the sample prior to analysis. The main modification is that the volumes of reagents and sample have been reduced tenfold to reduce waste. This reduction in reagent volume

is acceptable because modern dedicated mercury analyzers do not require the large volumes that previous manual methods required. Transfer a 10-mL aliquot of the sample to a digestion tube with a screw cap. Add 0.5 mL of concentrated H_2SO_4, 0.25 mL of concentrated HNO_3, and 1.5 mL of 5%$^W/_V$ $KMnO_4$ solution. Mix the solution, and allow it to stand for 15 minutes. Add 0.75 mL of 5%$^W/_V$ $K_2S_2O_8$ solution, and loosely cap the tube. Place the tube in a dry block heater or water bath equipped with a temperature probe, and heat to 95°C. Do not allow the temperature to exceed 95°C. Hold the sample at 95°C for 2 hours before allowing it to cool to room temperature. The purple color from the added $KMnO_4$ solution must remain throughout the digestion. Clearing of the solution during the heating indicates the depletion of $KMnO_4$. Prior to analysis, add 1 mL of 10%$^W/_V$ of solid hydroxylamine sulfate solution to the sample. The sample solution should remain clear after addition of hydroxylamine sulfate.

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13.3.4 *Preparation of HNO_3–H_2O_2 Impinger Solution (Containers 4 and 9)*—Dilute sample in a 250-mL volumetric flask to volume with water, and mix. Treat the sample with a modified version of EPA SW 846 7470. Modifications to the method are necessary to properly treat the H_2O_2-containing impinger solution before the analysis with CVAAS. The modifications include the addition of HCl, the use of an ice bath during the $KMnO_4$ addition, and the slow addition of the $KMnO_4$. Transfer a 5-mL aliquot of the sample to a digestion tube with a screw cap. Add 0.25 mL of concentrated HCl, place the tube in an ice bath, and allow it to cool for 15 minutes. The destruction of H_2O_2 is accomplished by slow addition of saturated $KMnO_4$ solution in 0.25-mL increments along the inside of the digestion tube. The violence of this reaction requires careful, slow addition of the $KMnO_4$ for safety reasons and to avoid loss of analyte. Cool the sample for 15 minutes in between each addition, and mix the sample prior to each addition. After the first five additions, increase the increments to 0.5 mL. Carry out the addition of $KMnO_4$ until the solution remains purple, indicating complete reaction of the H_2O_2. Record the volume of saturated $KMnO_4$ solution added to the sample. Add 0.75 mL of 5%$^W/_V$ $K_2S_2O_8$ solution to the sample, and then cap the tube loosely. Place the tubes in a dry block heater or water bath equipped with a temperature probe, and heat to 95°C. Do not allow the temperature to exceed 95°C. Maintain the sample at 95°C for 2 hours before allowing it to cool to room temperature. Note that the purple color due to $KMnO_4$ must remain throughout the digestion. Clearing of the solution during the heating indicates the depletion of $KMnO_4$. Before doing the analysis, add 1mL 10%$^W/_V$ of solid hydroxylamine sulfate solution to the sample. The sample should then become clear.

13.3.5 *Preparation of H_2SO_4–$KMnO_4$ Impinger Solution (Containers 5 and 10)*—Prepare the solution immediately prior to analysis. Dissolve by incrementally adding approximately 500 mg of solid hydroxylamine sulfate into the sample until a clear, colorless solution persists. Add the hydroxylamine slowly because of the violence of this reaction. Dilute the sample in a 500-mL volumetric flask to volume with water, and mix. Transfer a 10-mL aliquot of the sample to a digestion tube with a screw cap. Add 0.75 mL of 5%$^W/_V$ $K_2S_2O_8$ solution to the sample, and then cap the tube loosely. Place the tube in a dry block heater or water bath equipped with a temperature probe, and heat to 95°C. Do not allow the temperature to exceed 95°C. Hold the sample at 95°C for 2 hours before allowing it to cool to room temperature.

13.3.6 *Simplification of the Digestion*—If an acetone rinse was not used for gravimetric particulate determination or it is very clear, there is insignificant organic material present in the sampled gas stream; then the digestion procedure for the HNO_3–H_2O_2 and H_2SO_4–$KMnO_4$ impinger solutions may be simplified by omitting the persulfate digest (the addition of $K_2S_2O_8$ and heating). The persulfate digest is performed for the purpose of oxidizing certain organics. Because this method is specific to coal combustion systems where organic compounds are usually insignificant,[8] this digest may be omitted because the H_2O_2 is sufficient to oxidize most compounds. The decision to omit this procedure should be made based on the gas stream being sampled and/or verification that organics resistant to H_2O_2 oxidation are not present. If unsure whether organics are present or if an acetone rinse has been used, then the total digestion procedure is required.

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13.3.7 *0.1 N HNO_3 and 10%$^{w}/_{v}$ Hydroxylamine Sulfate Rinse Solutions (Containers 7 and 11)*—These solutions can be analyzed directly for mercury without any preparation steps.

13.4 *Sample Analysis*—Analyze all of the prepared solutions by CVAAS or CVAFS following the guidelines specified by the instrument manufacturer.

13.4.1 *QA/QC*—For this method, it is important that both the sampling team and analytical people be very well trained in the procedures. This is a complicated method that requires a high-level of sampling and analytical experience. For the sampling portion of the QA /QC procedure, both solution and field blanks are required. It should be noted that if high-quality reagents are used and care is taken in their preparation and in the train assembly, there should be little, if any, mercury measured in either the solution or field blanks.

As stated in Section 13.2.12 of this method, solution blanks will be taken and analyzed every time a new batch of solution is prepared. If mercury is detected in these solution blanks, the concentration is subtracted from the measured sample results. The maximum amount that can be subtracted is 10% of the measured result or 10 times the detection limit of the instrument which ever is lower. If the solution blanks are greater than 10% the data must be flagged as suspect.

A field blank is performed by assembling a sample train, transporting it to the sampling location during the sampling period, and recovering it as a regular sample. These data are used to ensure that there is no contamination as a result of the sampling activities. A minimum of one field blank at each sampling location must be completed for each test site. Any mercury detected in the field blanks cannot be subtracted from the results. Whether or not the mercury detected in the field blanks is significant is determined based on the QA/QC procedures established prior to the testing. At a minimum, if field blanks exceed 30% of the measured value at the corresponding location, the data must be flagged as suspect.

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[8] "A Comprehensive Assessment of Toxic Emissions from Coal-Fired Power Plants: Phase I Results from the U.S. Department of Energy Study," Prepared for the U.S. Department of Energy Federal Energy Technology Center, Contract No. DE-FC21-93MC30097, Energy & Environmental Research Center, University of North Dakota, Grand Forks, ND, 1996.

The QA/QC for the analytical portion of this method is that every sample, after it has been prepared, is to be analyzed in duplicate with every tenth sample analyzed in triplicate. These results must be within 10% of each other. If this is not the case, then the instrument must be recalibrated and the samples reanalyzed. In addition, after every ten samples, a known spike sample must be analyzed. For the ash samples, a certified reference ash sample (may be purchased from NIST) is to be digested and analyzed at least once during the test program. It is also suggested that the QA/QC procedures developed for a test program include submitting, on occasion, spiked mercury samples to the analytical laboratory by either the prime contractor if different from the laboratory or an independent organization.

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14. Flue Gas Calculations

14.1 *Dry Gas Volume*—Calculate the dry gas sample volume, $V_{m(std)}$, at standard conditions using Equation 1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m}\right)\left[\frac{P_{bar}+\Delta H}{P_{std}}\right] = K_1 V_m Y \frac{P_{bar}+\Delta H}{T_m} \qquad \text{[Eq. 1]}$$

where:

P_{bar} = barometric pressure at the sampling site, kPa (in. Hg)
P_{std} = standard absolute pressure, 101.3 kPa (29.92 in. Hg)
T_m = absolute average dry gas meter temperature (refer to Figure 2), K (°R)
T_{std} = standard absolute temperature, 293 K (528°R)
V_m = volume of gas sample as measured by dry gas meter, dcm (dscf)
$V_{m(std)}$ = volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf)
Y = dry gas meter calibration factor
ΔH = average pressure differential across the orifice meter (refer to Figure 2), kPa (in. Hg)
K_1 = 2.894 K/kPa (17.64°R/in. Hg)

Note 5—Equation 1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., leak checks conducted prior to component changes or following the test) exceeds the maximum acceptable leakage rate, L_a, equal to 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate, whichever is less. If the leakage rate observed during the posttest leak check, L_p, or an individual leakage rate observed during the leak check conducted prior to the "ith" component change (I = 1, 2, 3, . . .n), L_i, exceeds L_a, then Equation 1 must be modified as follows:

(a) **Case I.** No component changes made during sampling run. In this case, replace V_m with the expression:

$$[V_m - (L_p - L_a)\theta]$$

where:

L_p = leakage rate observed during the posttest leak check, m^3/min (cfm)
L_a = maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change—equal to 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate, whichever is less
θ = total sampling time, min

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(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m with the expression:

$$\left[V_m - (L_1 - L_a)\theta_1 - \sum_{i=1}^{n} (L_i - L_a)\theta_i - (L_p - L_a)\theta_p \right]$$

where:
θ_i = sampling time interval, from the beginning of a run until the first component change, min

and substitute only for those leakage rates (L_i or L_p) that exceed L_a.

14.2 *Volume of Water Vapor*—Calculate the volume of water vapor of the stack gas using Equation 2.

$$V_{w(std)} = \frac{W_{lc}\ R\ T_{std}}{M_w\ P_{std}} = K_2\ W_{lc} \qquad \text{[Eq. 2]}$$

where:
M_w = molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole)
R = ideal gas constant, 0.008314 kPa-m^3/K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole)
W_{lc} = total weight of liquid collected in impingers and silica gel (refer to Figure 2), g
$V_{w(std)}$ = volume of water vapor in the gas sample, corrected to standard conditions, scm (scf)
K_2 = 0.001336 m^3/mL (0.04707 ft^3/mL)

14.3 *Volume of Moisture*—Calculate the moisture content, B_{ws}, of the stack gas using Equation 3.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad \text{[Eq. 3]}$$

where:
B_{ws} = water vapor in the gas stream, proportion by volume

15. Calculations for Particle-Bound, Oxidized, Elemental, and Total Mercury Concentrations:

15.1 *Particle-Bound Mercury*

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15.1.1 *Case 1: Amount of Ash on the Filter is Greater Than 0.5 g.* Calculate the concentration of mercury in µg/g in the ash sample (Hg_{ash}) using Equation 4:

$$Hg_{ash}, \mu g/g = (IR)(DF) \qquad \text{[Eq. 4]}$$

where:
IR = instrument reading, µg/L
DF = dilution factor = (total digested volume, L)/(mass of ash digested, g)

Calculate the amount of mercury in the probe rinse (Hg_{pr}, Container 2) in µg using Equation 5:

$$Hg_{pr}, \mu g = (IR)(V_1) \qquad \text{[Eq. 5]}$$

where:
IR = instrument reading, µg/L
V_1 = total volume of probe rinse sample from which sample aliquot was taken, L

Calculate the amount of mercury on the sample filter blank (Hg_{fb}) in the same way using Equation 6.

$$Hg_{fb}, \mu g = (IR)(V_2) \qquad \text{[Eq. 6]}$$

where:
IR = instrument reading, µg/L
V_2 = total volume of sample filter blank digest, L

The total amount of particle-bound mercury (Hg_{tp}) is then determined using Equation 7:

$$Hg\ (particle), \mu g = (Hg_{ash})(W_{ash}) - Hg_{fb} + Hg_{pr} \qquad \text{[Eq. 7]}$$

where:
W_{ash} = the total ash weight on filter, g

The concentration of particle-bound mercury (µg/dscm) in the gas stream is then determined using Equation 8:

$$Hg^{tp}, \mu g/dscm = Hg\ (particle)/V_{m(std)} \qquad \text{[Eq. 8]}$$

where:
$V_{m(std)}$ = is the total volume of dry gas sampled at standard (normal) conditions, dscm

15.1.2 *Case 2: Amount of Ash on the Filter is Less Than 0.5 g*—The calculation is the same as in Case 1 except the entire sample (ash and filter) is digested; therefore, DF in Equation 4 is defined only by the total digested volume. Equations 5–7 remain the same.

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15.2 *Oxidized Mercury*

15.2.1 *KCl Solution (Impingers 1–3)*—Calculate the concentration of mercury in µg/L in the KCl impinger solutions using Equation 9:

$$Hg_{KCl}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 9]}$$

where:

IR = instrument reading, µg/L

DF = dilution factor, $\frac{V_D + V(H_2SO_4) + V(HNO_3) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

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V_D = total digested volume, 10 mL

$V(H_2SO_4)$ = volume of added concentrated H_2SO_4, 0.5 mL

$V(HNO_3)$ = volume of added concentrated HNO_3, 0.5 mL

$V(KMnO_4)$ = volume of added 5%$^W/_V$ $KMnO_4$, 1.5 mL

$V(K_2S_2O_8)$ = volume of added 5%$^W/_V$ $K_2S_2O_4$, 0.75 mL

$V(NH_2OH$ = volume of added 10%$^W/_V$ hydroxylamine sulfate, 1.0 mL

The amount of mercury in the KCl solution blank is calculated in the same way.

15.2.2 *Total Oxidized Mercury (Hg_O)*—is defined by method as the mercury measured in the KCl sample minus the mercury measured in the KCl solution blanks, as shown in Equation 10:

$$Hg_O, \mu g = (Hg_{KCl})(V_3) - (Hg_{Ob})(V_3) \qquad \text{[Eq. 10]}$$

where:

Hg_{KCl} = Mercury concentration measured in KCl aliquot, µg/L

V_3 = Total volume of aqueous KCl from which sample aliquot was taken, L

Hg_{Ob} = Mercury concentration measured in KCl solution blank aliquot, µg/L

The concentration of Hg^{2+} (µg/dscm) in the gas stream is then determined using Equation 11:

$$Hg^{2+}, \mu g/dscm = Hg_O/V_{m(std)} \qquad \text{[Eq. 11]}$$

where:

$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.3 *Elemental Mercury*

15.3.1 *HNO_3–H_2O_2 Solution (Impinger 4)*—Calculate the concentration of mercury in µg/L in the HNO_3–H_2O_2 impinger solution using Equation 12:

$$Hg_{H2O2}, \mu g/L = (IR)(DF) \qquad \text{[Eq. 12]}$$

where:

IR = instrument reading, µg/L

DF = dilution factor = $\frac{V_D + V(HCl) + V(KMnO_4) + V(K_2S_2O_8) + V(NH_2OH)}{V_D}$

V_D = total digested volume, 5 mL

V(HCl) = volume of added concentrated HCl, 0.25 mL

$V(KMnO_4)$ = volume of added saturated $KMnO_4$, mL (volume need to turn sample to a purple color)

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL (if used)
$V(NH_2OH$ = volume of added 10%$^{W}/_{V}$ hydroxylamine sulfate, 1.0 mL

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The amount of mercury in the HNO_3–H_2O_2 solution blank is calculated in the same way.

15.3.2 *H_2SO_4–$KMnO_4$ Solution (Impingers 5–7)*—Calculate the concentration of mercury in µg/L in the H_2SO_4–$KMnO_4$ impinger solutions using Equation 13:

$$\text{Mercury, } \mu g/L = (IR)(DF) \qquad \text{[Eq. 13]}$$

where:

DF = dilution factor = $\frac{V_D + V(K_2S_2O_8)}{V_D}$

IR = instrument reading, µg/L

V_D = total digested volume, 5 mL

$V(K_2S_2O_8)$ = volume of added 5%$^{W}/_{V}$ $K_2S_2O_4$, 0.75 mL (if used)

The concentration of mercury in the H_2SO_4–$KMnO_4$ solution blank is calculated in the same way.

15.3.3 *Total Elemental Mercury (Hg_E)*—is defined by method as the mercury measured in the H_2SO_4–$KMnO_4$ impingers plus the mercury in the HNO_3–H_2O_2 impingers minus the solution blanks as shown in Equation 14:

$$Hg_E, \mu g = (Hg_{H2O2})(V_4) - (Hg_{Eb1})(V_4) + (Hg_{KMnO4})(V_5) - (H_{Eb2})(V_5) \qquad \text{[Eq. 14]}$$

where:

Hg_{H2O2} = Mercury concentration measured in HNO_3–H_2O_2 aliquot, µg/L
V_4 = Total volume of aqueous HNO_3–H_2O_2 from which sample aliquot was taken, L
Hg_{Eb1} = Mercury concentration measured in HNO_3–H_2O_2 solution blank aliquot, µg/L
Hg_{KMnO4} = Mercury concentration measured in H_2SO_4–$KMnO_4$ aliquot, µg/L
V_5 = Total volume of aqueous H_2SO_4–$KMnO_4$ from which sample aliquot was taken, L
Hg_{Eb2} = Mercury concentration measured in H_2SO_4–$KMnO_4$ solution blank aliquot, µg/L

The concentration of Hg^{2+} (µg/dscm) in the gas stream is then determined using Equation 15:

$$Hg^0, \mu g/dscm = Hg_E/V_{m(std)} \qquad \text{[Eq. 15]}$$

where:

$V_{m(std)}$ is the total volume of dry gas sampled at standard conditions, dscm

15.4 *Total Mercury*—Is defined by the method as the sum of the particulate bound mercury, oxidized mercury, and elemental mercury as shown in Equation 16:

$$Hg(total), \mu g/dscm = Hg^{tp} + Hg^{2+} + Hg^{0} \quad \text{[Eq. 16]}$$

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16. Precision and Bias

16.1 *Precision*

16.1.1 Formal evaluation of the Ontario Hydro method was completed with dynamic spiking of Hg^0 and $HgCl_2$ into a flue gas stream.[9] The results are shown in Table 1. The relative standard deviation for gaseous elemental mercury and oxidized mercury was found to be less than 11% for mercury concentrations greater than 3 $\mu g/Nm^3$ and less than 34% for mercury concentrations less than 3 $\mu g/Nm^3$. In all cases, the laboratory bias for these tests based on a calculated correction factor was not statistically significant. These values were within the acceptable range, based on the criteria established in EPA Method 301 (% RSD less than 50%).

16.1.2 The precision of particle-bound, oxidized, and elemental mercury sampling method data is influenced by many factors: flue gas concentration, source, procedural, and equipment variables. Strict adherence to the method is necessary to reduce the effect of these variables. Failure to assure a leak-free system, failure to accurately calibrate all indicated system components, failure to select a proper sampling location, failure to thoroughly clean all glassware, and failure to follow prescribed sample recovery, preparation, and analysis procedures can seriously affect the precision of the results.

16.2 *Bias*

16.2.1 Gaseous mercury species in flue gases that are capable of interacting with fly ash particles collected in the front half of the sampling train can produce a positive particle-bound mercury bias.

16.2.2 Particle-bound mercury existing in the flue gas may vaporize after collection in the front half of the sampling train because of continued exposure to the flue gas sample stream and reduced pressures during the sampling period. Such vaporization would result in a negative particle-bound mercury bias.

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[9] EPRI. "Evaluation of Flue Gas Mercury Speciation Methods," EPRI TR-108988, Electric Power Research Institute, Palo Alto, CA, Dec. 1997.

Table 1

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Results from Formal EPA Method 301 Evaluation Tests for the Ontario Hydro Method*

Ontario Hydro Method**	Total Vapor-Phase Mercury			Oxidized Mercury			Elemental Mercury		
	Mean, $\mu g/Nm^3$	Std. Dev.	RSD, %	Mean, $\mu g/Nm^3$	Std. Dev.	RSD, %	Mean, $\mu g/Nm^3$	Std. Dev.	RSD, %
Baseline	23.35	2.05	8.79	21.24	2.13	10.02	2.11	0.65	30.69
Hg^0 Spike (15.0 $\mu g/Nm^3$)	38.89	2.00	5.13	23.32	2.08	8.94	15.57	1.09	6.97
$HgCl_2$ Spike (19.9 $\mu g/Nm^3$)	42.88	2.67	6.23	40.22	2.87	7.14	2.66	0.89	33.31

* For each mean result, there were 12 replicate samples (four quadtrains)

** The correction factor in all cases was not statically significant and is not shown.

17. **Keywords**—Air toxics, mercury, sampling, speciation

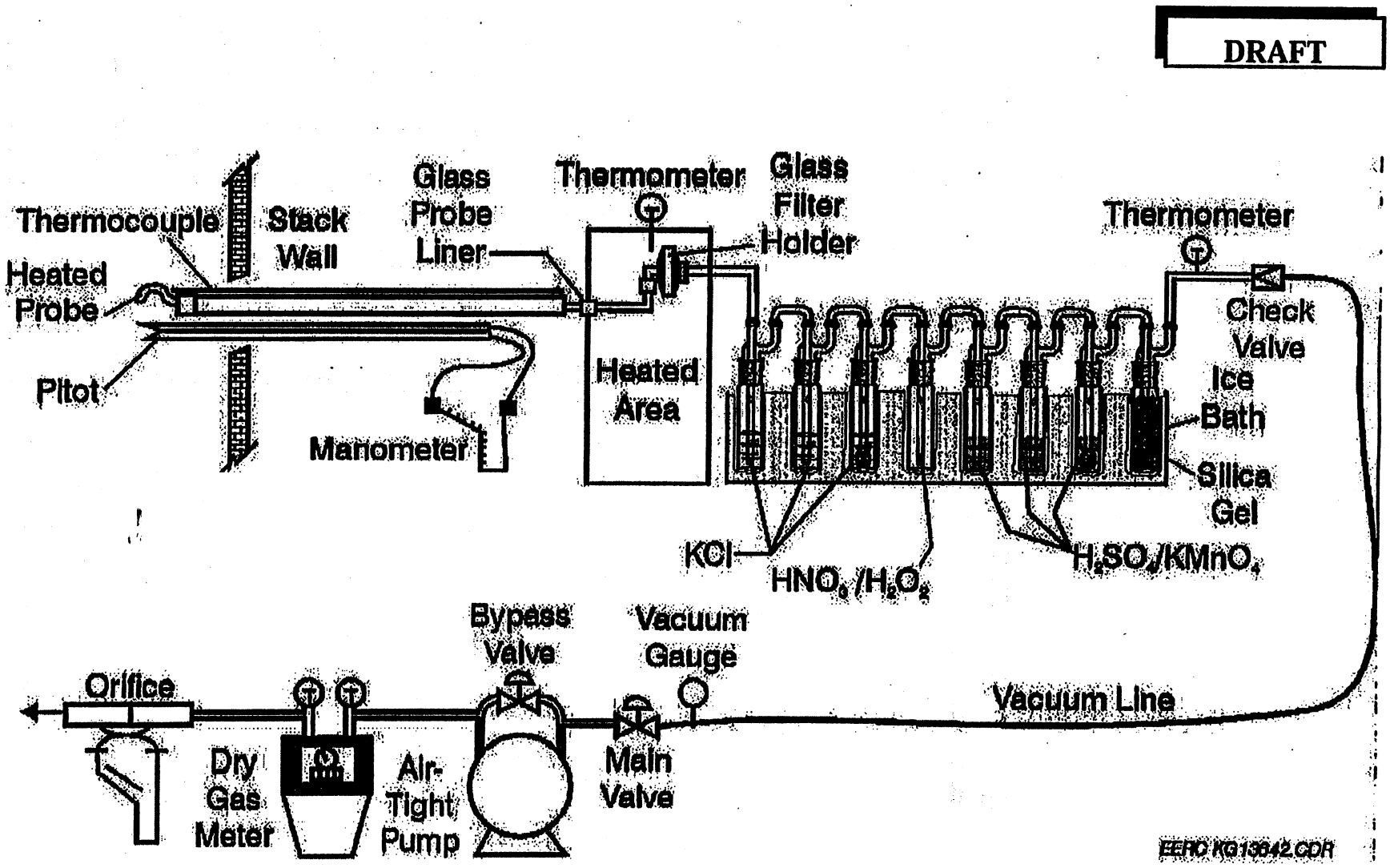

FIG. 1. Schematic of Mercury-Sampling Train in the Method 5 Configuration

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Plant.....

Location.....

Operator.....

Date.....

Run No. .....

Sample Box No. .....

Meter Box No. .....

Meter ΔH @ (kPa).....

C factor.....

Pitot tube coefficient, C_p .....

Schematic of Stack Cross Section

Ambient Temperature °C (°F) .....

Barometric Pressure kPa (in. Hg).....

Assumed Moisture, % .....

Probe Length, m (ft) .....

Nozzle Identification No. .....

Average Calibrated Nozzle Diameter, cm (in.) .....

Probe Heater Setting °C (°F) .....

Leak Rate, m^3/min (cfm) .....

Static Pressure, kPa (in. Hg) .....

Filter No. .....

Traverse Point Number	Sampling Time min	Vacuum kPa (in. Hg)	Stack Temp. (T_s), °C (°F)	Velocity Head (ΔP_s) kPa (in. H_2O)	Pressure Differential kPa (in. H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter		Filter Exit Temp. °C (°F)	Probe Exit Temp. °C (°F)	Final Impinger Exit Temp. °C (°F)
							Inlet °C (°F)	Outlet °C (°F)			
Total											
Average											

FIG. 2. Mercury-Sampling Field Data Report

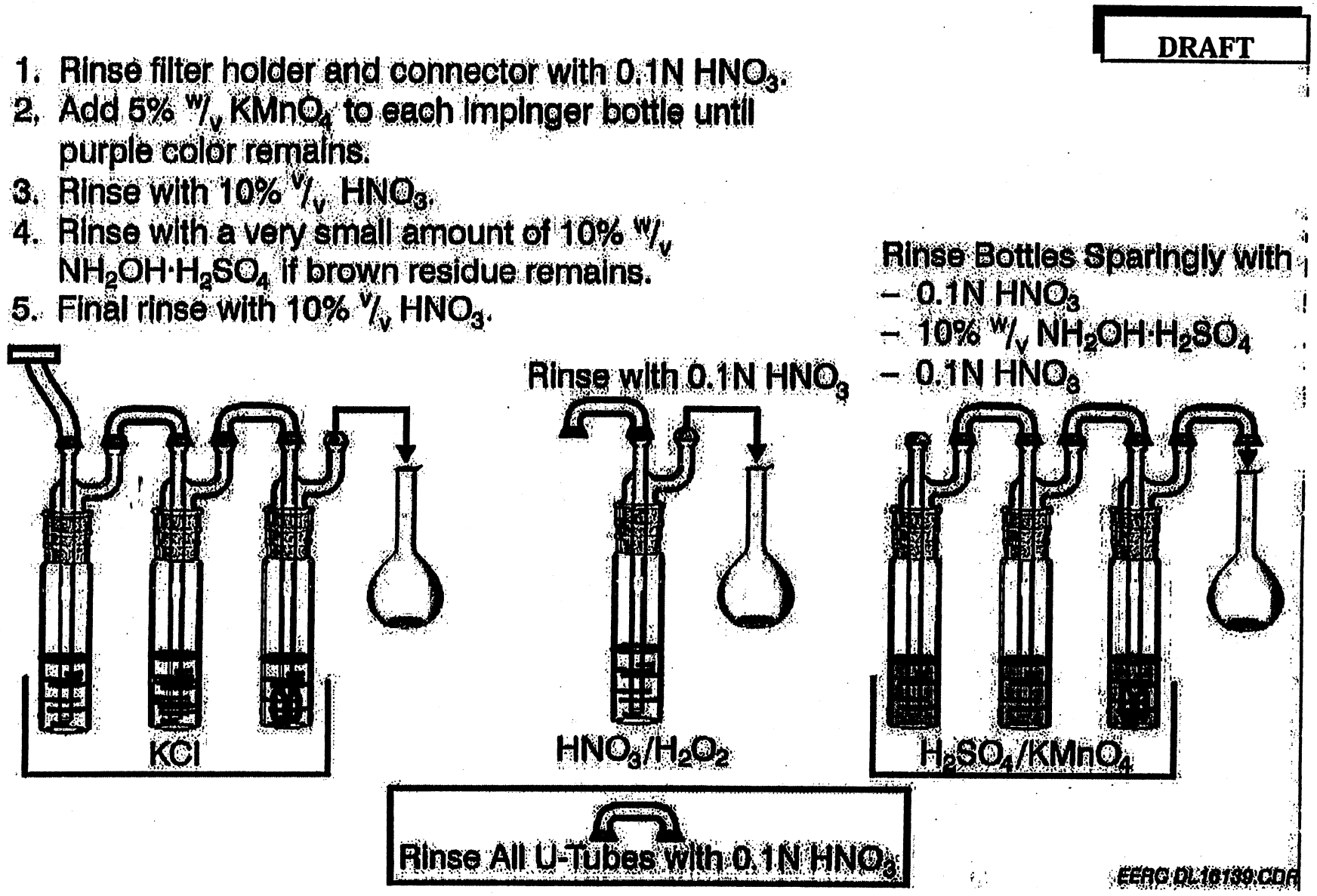

FIG. 3. Sample Recovery Scheme for the Mercury-Sampling Train

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(1) Method 303F in *Standard Methods for the Examination of Water and Wastewater*, 15th Edition, 1980. Available from the American Public Health Association, 1015 18th Street N.W., Washington, D.C. 20036.

(2) EPA Methods 6010, 6020, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 7841, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846, Third Edition. September 1988. Office of Solid Waste and Emergency Response, U. S. Environmental Protection Agency, Washington, D.C. 20460.

(3) EPA Methods 1 through 5, *Code of Federal Regulations*, Title 40, Part 60, Appendix A, July 1, 1991.

(4) EPA Method 101A, *Code of Federal Regulations*, Title 40, Part 61, Appendix B, July 1, 1991.

(5) EPA Method 29, *Emission Measurement Technical Information Center*, EMTIC TM-029, April 25, 1996.

(6) U.S. Environmental Protection Agency "Method 301 - Field Validation of Pollutant Measurement Method from Various Waste Media," In *Code of Federal Regulations*, Title 40, Parts 61 to 80. Washington, DC, USA, Office of the Federal Register, Part 63, Appendix A, pp 324-331, July 1993.

METHOD 1— SAMPLE AND VELOCITY TRAVERSES FOR STATIONARY SOURCES

1. Principle and Applicability

1.1 Principle. To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

1.2 Applicability. This method is applicable to flowing gas streams in ducts, stacks, and flues. The method cannot be used when: (1) flow is cyclonic or swirling (see Section 2.4), (2) a stack is smaller than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) cross-sectional area, or (3) the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

The requirements of this method must be considered before construction of a new facility from which emissions will be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator, U.S. Environmental Protection Agency.

2. Procedure

2.1 Selection of Measurement Site. Sampling or velocity measurement is performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance. For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2\,LW}{(L + W)}$$

where: L=length and W=width.

An alternative procedure is available for determining the acceptability of a measurement location not meeting the criteria above. This precedure, determination of gas flow angles at the sampling points and comparing the results with acceptability criteria, is described in Section 2.5.

2.2 Determining the Number of Traverse Points.

2.2.1 Particulate Traverses. When the eight- and two-diameter criterion can be met, the minimum number of traverse points shall be: (1) twelve, for circular or rectangular stacks with

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diameters (or equivalent diameters) greater than 0.61 meter (24 in.); (2) eight, for circular stacks with diameters between 0.30 and 0.61 meter (12-24 in.); (3) nine, for rectangular stacks with equivalent diameters between 0.30 and 0.61 meter (12-24 in.).

When the eight- and two-diameter criterion cannot be met, the minimum number of traverse points is determined from Figure 1-1. Before referring to the figure, however, determine the distances from the chosen measurement site to the nearest upstream and downstream disturbances, and divide each distance by the stack diameter or equivalent diameter, to determine the distance in terms of the number of duct diameters. Then, determine from Figure 1-1 the minimum number of traverse points that corresponds: (1) to the number of duct diameters upstream; and (2) to the number of diameters downstream. Select the higher of the two minimum numbers of traverse points, or a greater value, so that for circular stacks the number is a multiple of 4, and for rectangular stacks, the number is one of those shown in Table 1-1.

Table 1-1. Cross-Section Layout for Rectangular Stacks

Number of traverse points	Matrix layout
9	3x3
12	4x3
16	4x4
20	5x4
25	5x5
30	6x5
36	6x6
42	7x6
49	7x7

2.2.2 Velocity (Non-Particulate) Traverses. When velocity or volumetric flow rate is to be determined (but not particulate matter), the same procedure as that for particulate traverses (Section 2.2.1) is followed, except that Figure 1-2 may be used instead of Figure 1-1.

2.3 Cross-sectional Layout and Location of Traverse Points.

2.3.1 Circular Stacks. Locate the traverse points on two perpendicular diameters according to Table 1-2 and the example shown in Figure 1-3. Any equation (for examples, see Citations 2 and 3 in the Bibliography) that gives the same values as those in Table 1-2 may be used in lieu of Table 1-2.

For particulate traverses, one of the diameters must be in a plane containing the greatest expected concentration variation, e.g., after bends, one diameter shall be in the plane of the bend. This requirement becomes less critical as the distance from the disturbance increases; therefore,

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other diameter locations may be used, subject to approval of the Administrator.

In addition for stacks having diameters greater than 0.61 m (24 in.) no traverse points shall be located within 2.5 centimeters (1.00 in.) of the stack walls; and for stack diameters equal to or less than 0.61 m (24 in.), no traverse points shall be located within 1.3 cm (0.50 in.) of the stack walls. To meet these criteria, observe the procedures given below.

2.3.1.1 Stacks With Diameters Greater Than 0.61 m (24 in.). When any of the traverse points as located in Section 2.3.1 fall within 2.5 cm (1.00 in.) of the stack walls, relocate them away from the stack walls to: (1) a distance of 2.5 cm (1.00 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger. These relocated traverse points (on each end of a diameter) shall be the "adjusted" traverse points.

Whenever two successive traverse points are combined to form a single adjusted traverse point, treat the adjusted point as two separate traverse points, both in the sampling (or velocity measurement) procedure, and in recording the data.

Table 1-2.Location of Traverse Points in Circular Stacks

Traverse point number on a diameter	2	4
1	14.6	
2	85.4	
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		

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23		
24		

Traverse point number on a diameter	24
1	1.1
2	3.2
3	5.5
4	7.9
5	10.5
6	13.2
7	16.1
8	19.4
9	23.0
10	27.2
11	32.3
12	39.8
13	60.2
14	67.7
15	72.8
16	77.0
17	80.6
18	83.9
19	86.8
20	89.5
21	92.1
22	94.5
23	96.8
24	98.9

2.3.1.2 Stacks With Diameters Equal to or Less Than 0.61 m (24 in.). Follow the procedure in Section 2.3.1.1, noting only that any "adjusted" points should be relocated away from the stack walls to: (1) a distance of 1.3 cm (0.50 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger.

2.3.2 Rectangular Stacks. Determine the number of traverse points as explained in Sections 2.1 and 2.2 of this method. From Table 1-1 , determine the grid configuration. Divide the stack cross-section into as many equal rectangular elemental areas as traverse points, and then locate a traverse point at the centroid of each equal area according to the example in Figure 1-4.

If the tester desires to use more than the minimum number of traverse points, expand the "minimum number of traverse points" matrix (see Table 1-1) by adding the extra traverse points along one or the other or both legs of the matrix; the final matrix need not be balanced. For example, if a 4x3 "minimum number of points" matrix were expanded to 36 points, the final

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matrix could be 9x4 or 12x3, and would not necessarily have to be 6x6. After constructing the final matrix, divide the stack cross-section into as many equal rectangular, elemental areas as traverse points, and locate a traverse point at the centroid of each equal area.

The situation of traverse points being too close to the stack walls is not expected to arise with rectangular stacks. If this problem should ever arise, the Administrator must be contacted for resolution of the matter.

2.4 Verification of Absence of Cyclonic Flow. In most stationary sources, the di-rection of stack gas flow is essentially parallel to the stack walls. However, cyclonic flow may exist (1) after such devices as cyclones and inertial demisters following venturi scrubbers, or (2) in stacks having tangential inlets or other duct configurations which tend to induce swirling; in these instances, the presence or absence of cyclonic flow at the sampling location must be determined. The following techniques are acceptable for this determination.

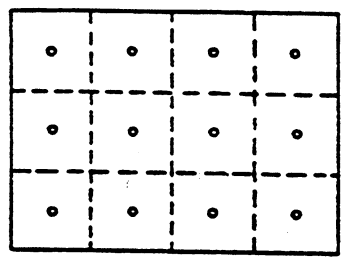

Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

Level and zero the manometer. Connect a Type S pitot tube to the manometer. Position the Type S pitot tube at each traverse point, in succession, so that the planes of the face openings of the pitot tube are perpendicular to the stack cross-sectional plane; when the Type S pitot tube is in this position, it is at "0° reference." Note the differential pressure (S *p*) reading at each traverse point. If a null (zero) pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point. If the pitot reading is not zero at 0° reference, rotate the pitot tube (up to ±90° yaw angle), until a null reading is obtained. Carefully determine and record the value of the rotation angle (*a*) to the nearest degree. After the null technique has been applied at each traverse point, calculate the average of the absolute values of *a*; assign *a* values of 0° to those points for which no rotation was required, and include these in the overall average. If the average value of *a* is greater than 20°, the overall flow condition in the stack is unacceptable and alternative methodology, subject to the approval of the Administrator, must be used to perform accurate sample and velocity traverses.

The alternative procedure described in Section 2.5 may be used to determine the rotation angles in lieu of the procedure described above.

2.5 Alternative Measurement Site Selection Procedure. This alternative applies to sources where measurement locations are less than 2 equivalent stack or duct diameters downstream or less than ½ duct diameter upstream from a flow disturbance. The alternative should be limited to ducts larger than 24 in. in diameter where blockage and wall effects are minimal. A directional

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flow-sensing probe is used to measure pitch and yaw angles of the gas flow at 40 or more traverse points; the resultant angle is calculated and compared with acceptable criteria for mean and standard deviation.

NOTE: Both the pitch and yaw angles are measured from a line passing through the traverse point and parallel to the stack axis. The pitch angle is the angle of the gas flow component in the plane that INCLUDES the traverse line and is parallel to the stack axis. The yaw angle is the angle of the gas flow component in the plane PERPENDICULAR to the traverse line at the traverse point and is measured from the line passing through the traverse point and parallel to the stack axis.

2.5.1 Apparatus.

2.5.1.1 Directional Probe. Any directional probe, such as United Sensor Type DA Three-Dimensional Directional Probe, capable of measuring both the pitch and yaw angles of gas flows is acceptable. (NOTE: Mention of trade name or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.) Assign an identification number to the directional probe, and permanently mark or engrave the number on the body of the probe. The pressure holes of directional probes are susceptible to plugging when used in particulate-laden gas streams. Therefore, a system for cleaning the pressure holes by "back-purging" with pressurized air is required.

2.5.1.2 Differential Pressure Gauges. Inclined manometers, U-tube manometers, or other differential pressure gauges (e.g., magnehelic gauges) that meet the specifications described in Method 2, section 2.2.

NOTE: If the differential pressure gauge produces both negative and positive readings, then both negative and positive pressure readings shall be calibrated at a minimum of three points as specified in Method 2, section 2.2.

2.5.2 Traverse Points. Use a minimum of 40 traverse points for circular ducts and 42 points for rectangular ducts for the gas flow angle determinations. Follow section 2.3 and Table 1-1 or 1-2 for the location and layout of the traverse points. If the measurement location is determined to be acceptable according to the criteria in this alternative procedure, use the same traverse point number and locations for sampling and velocity measurements.

2.5.3 Measurement Procedure.

2.5.3.1 Prepare the directional probe and differential pressure gauges as recommended by the manufacturer. Capillary tubing or surge tanks may be used to dampen pressure fluctuations. It is recommended, but not required, that a pretest leak check be conducted. To perform a leak check, pressurize or use suction on the impact opening until a reading of at least 7.6 cm (3 in.) H_2O registers on the differential pressure gauge, then plug the impact opening. The pressure of a leak-free system will remain stable for at least 15 seconds.

2.5.3.2 Level and zero the manometers. Since the manometer level and zero may drift because of vibrations and temperature changes, periodically check the level and zero during the traverse.

2.5.3.3 Position the probe at the appropriate locations in the gas stream, and rotate until zero deflection is indicated for the yaw angle pressure gauge. Determine and record the yaw angle. Record the pressure gauge readings for the pitch angle, and determine the pitch angle' from the calibration curve. Repeat this procedure for each traverse point. Complete a "back-purge" of the pressure lines and the impact openings prior to measurements of each traverse point.

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A post-test check as described in section 2.5.3.1 is required. If the criteria for a leak-free system are not met, repair the equipment, and repeat the flow angle measurements.

2.5.4 Calculate the resultant angle at each traverse point, the average resultant angle, and the standard deviation using the following equations. Complete the calculations retaining at least one extra significant figure beyond that of the acquired data. Round the values after the final calculations.

2.5.4.1 Calculate the resultant angle at each traverse point:

R_i=arc cosine [(cosine Y_i)(cosine P_i)] Eq. 1-2

Where:

R_i=Resultant angle at traverse point i, degree.

Y_i=Yaw angle at traverse point i, degree.

P_i=Pitch angle at traverse point i, degree.

2.5.4.2 Calculate the average resultant for the measurements:

$$R_{avg} = \frac{\sum R_i}{n} \qquad \text{Eq. 1-3}$$

Eq. 1-3

Where:

3=Average resultant angle, degree.

n=Total number of traverse points.

2.5.4.3 Calculate the standard deviations:

$$S_d = \frac{\sum_{i=1}^{n} \left(R_i - R_{avg}\right)^2}{(n-1)}$$

Eq. 1-4

Where:

S_d=Standard deviation, degree.

2.5.5 The measurement location is acceptable if 3£20° and S_d£10°.

2.5.6 Calibration. Use a flow system as described in Sections 4.1.2.1 and 4.1.2.2 of Method 2. In addition, the flow system shall have the capacity to generate two test-section velocities: one between 365 and 730 m/min (1200 and 2400 ft/min) and one between 730 and 1100 m/min (2400 and 3600 ft/min).

2.5.6.1 Cut two entry ports in the test section. The axes through the entry ports shall be perpendicular to each other and intersect in the centroid of the test section. The ports should be elongated slots parallel to the axis of the test section and of sufficient length to allow measurement of pitch angles while maintaining the pitot head position at the test-section centroid.

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To facilitate alignment of the directional probe during calibration, the test section should be constructed of plexiglass or some other transparent material. All calibration measurements should be made at the same point in the test section, preferably at the centroid of the test-section.

2.5.6.2 To ensure that the gas flow is parallel to the central axis of the test section, follow the procedure in Section 2.4 for cyclonic flow determination to measure the gas flow angles at the centroid of the test section from two test ports located 90° apart. The gas flow angle measured in each port must be ±2°of 0°. Straightening vanes should be installed, if necessary, to meet this criterion.

2.5.6.3 Pitch Angle Calibration. Perform a calibration traverse according to the manufacturer's recommended protocol in 5° increments for angles from -60° to +60° at one velocity in each of the two ranges specified above. Average the pressure ratio values obtained for each angle in the two flow ranges, and plot a calibration curve with the average values of the pressure ratio (or other suitable measurement factor as recommended by the manufacturer) versus the pitch angle. Draw a smooth line through the data points. Plot also the data values for each traverse point. Determine the differences between the measured data values and the angle from the calibration curve at the same pressure ratio. The difference at each comparison must be within 2° for angles between 0° and 40° and within 3° for angles between 40° and 60°.

2.5.6.4 Yaw Angle Calibration. Mark the three-dimensional probe to allow the determination of the yaw position of the probe. This is usually a line extending the length of the probe and aligned with the impact opening. To determine the accuracy of measurements of the yaw angle, only the zero or null position need be calilbrated as follows. Place the directional probe in the test section, and rotate the probe until the zero position is found. With a protractor or other angle measuring device, measure the angle indicated by the yaw angle indicator on the three-dimensional probe. This should be within 2° of 0°. Repeat this measurement for any other points along the length of the pitot where yaw angle measurements could be read in order to account for variations in the pitot markings used to indicate pitot head positions.

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APPENDIX E

Sampling Equipment Calibration Data

Radian Source Sampling Temperature Readout Calibration Form
Per Reference EMSOP001

Operator RVW
Date 11-09-99

Readout ID Number A161362
Thermometer ID Number ZN7177
Voltage Generator ID Number A178550

Temperature Readout Calibration	
Thermometer (°F)	Temperature Readout (°F) (after adjustment)
32.0	32.0 RVW

Temperature Readout Calibration Check

Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference	Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference
1	0.0	32	32	0	5	-1.0	-10	-13	3
	1.0	77	77	0		0.0	32	32	0
	3.0	165	165	0		1.0	77	77	0
	7.0	341	342	1		2.0	121	121	0
	15.0	692	693	1		3.0	165	165	0
2	0.0	32	32	0	6	-1.0	-10	-12	2
	3.0	165	164	1		0.0	32	32	0
	4.0	208	209	1		1.0	77	77	0
	5.0	251	251	0		2.0	121	121	0
	7.0	341	341	0		3.0	165	165	0
3	0.0	32	32	0	7	-1.0	-10	-11	1
	3.0	165	165	0		0.0	32	32	0
	4.0	208	208	0		1.0	77	77	0
	5.0	251	251	0		2.0	121	121	0
	7.0	341	341	0		3.0	165	164	1
4	-1.0	-10	-12	2					
	0.0	32	32	0					
	1.0	77	76	1					
	2.0	121	121	0					
	3.0	165	165	0					

RVW

Acceptable difference is ±5°F for temperatures below 1000°F and ±10° for temperatures

Five Point Console Dry Gas Meter Calibration Form

Console ID: A161362 Pump ID: — Date: 11-04-97 Signature: RVW

Dry Gas Meter		Run 1A	Run 1B	Run 2A	Run 2B	Run 3A	Run 3B	Run 4A	Run 4B	Run 5A	Run 5B
Orifice Identification Code		A175936		A175935		A175932		A175933		A175934	
Orifice K Factor		0.2603		0.4340		0.5712		0.6955		0.8576	
Initial Reading (ft³)		161.111	164.552	168.000	173.735	105.500	112.992	120.478	129.368	138.264	149.662
Final Reading (ft³)		164.552	168.000	173.735	179.473	112.992	120.478	129.368	138.264	149.662	161.111
Meter Temp. (°F)	Initial Inlet	92	84	84	86	74	78	82	85	86	90
	Initial Outlet	80	80	80	80	71	71	72	74	75	77
	Final Inlet	84	84	86	87	78	82	85	86	90	92
	Final Outlet	80	80	80	80	71	72	74	75	77	80
Test Time (minutes)		10	10	10	10	10	10	10	10	10	10
Orifice Manometer, ΔH ("H_2O)		0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.5	4.5
Barometric Pressure ("Hg)		29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60
Ambient Temperature (°F)		71	71	71	71	71	71	71	71	71	71
Pump Vacuum ("Hg)		18	18	18	18	18	18	18	18	17	17
DGM Calibration Factor (Y)		1.011	1.006	1.007	1.008	0.996	1.001	0.999	1.002	0.992 RVW	0.993 RVW
Calibration ΔH@		1.791	1.797	1.927	1.925	2.014	2.006	1.984	1.977	2.055	2.045

Avg. $Y_{previous}$ = 0.982 Avg. $Y_{current}$ = 1.002 % Difference = 1.952 Avg. ΔH@ = 1.952

Notes: NEW SEMI-ANNUAL Spt. AFTER ADJUSTMENT OF TANGENT ARM. RVW

5 Point Console Calibration

Console ID: A161362
Date: 11/04/99

Orifice ID:	A175936	A175935	A175932	A175933	A175934
Orifice K':	0.2603	0.4340	0.5712	0.6755	0.8576

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b	Run #4a	Run #4b	Run #5a	Run #5b
Initial Reading, (ft3)	161.111	164.552	168.000	173.735	105.500	112.992	120.478	129.368	138.264	149.662
Final Reading, (ft3)	164.552	168.000	173.735	179.473	112.992	120.478	129.368	138.264	149.662	161.111
Difference, (ft3)	3.441	3.448	5.735	5.738	7.492	7.486	8.890	8.896	11.398	11.449
Initial Meter Inlet Temp., (F)	92	84	84	86	74	78	82	85	86	90
Initial Meter Outlet Temp., (F)	80	80	80	80	71	71	72	74	75	77
Final Meter Inlet Temp., (F)	84	84	86	87	78	82	85	86	90	92
Final Meter Outlet Temp., (F)	80	80	80	80	71	72	74	75	77	80
Average Meter Temp., (F)	84.0	82.0	82.5	83.3	73.5	75.8	78.3	80.0	82.0	84.8
Test Time (min.)	10	10	10	10	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.5	4.5
Barometric Pressure, ("Hg)	29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60	29.60
Ambient Temperature, (F)	71	71	71	71	71	71	71	71	71	71
Pump Vacuum, ("Hg)	18	18	18	18	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	3.306	3.325	5.535	5.530	7.368	7.331	8.682	8.660	11.103	11.097
Standard Volume of Critical Orifice, (Vcrstd)	3.344	3.344	5.575	5.575	7.337	7.337	8.677	8.677	11.016	11.016
DGM Calibration Factor, (Y)	1.011	1.006	1.007	1.008	0.996	1.001	0.999	1.002	0.992	0.993
Delta H@	1.791	1.797	1.927	1.925	2.014	2.006	1.984	1.977	2.055	2.045

Current Average Y = 1.002
Previous Average Y = 0.982
Percent Difference = 1.952
Average Delta H@ = 1.952
@STD= 0.0063

5 pt. calibration passes ✓ does not pass ____ 0.950 to 1.050 criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture=

Pre ✓ Post___ Test Console Calibration Check

Console ID: A161362
Date: 11/04/99

Orifice ID:	A175935	A175932	A175933
Orifice K':	0.4340	0.5712	0.6755

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b
Initial Reading, (ft3)	168.000	173.735	105.500	112.992	120.478	129.368
Final Reading, (ft3)	173.735	179.473	112.992	120.478	129.368	138.264
Difference, (ft3)	5.735	5.738	7.492	7.486	8.890	8.896
Initial Meter Inlet Temp., (F)	84	86	74	78	82	85
Initial Meter Outlet Temp., (F)	80	80	71	71	72	74
Final Meter Inlet Temp., (F)	86	87	78	82	85	86
Final Meter Outlet Temp., (F)	80	80	71	72	74	75
Average Meter Temp., (F)	82.5	83.3	73.5	75.8	78.3	80.0
Test Time (min.)	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	1.1	1.1	1.95	1.95	2.7	2.7
Barometric Pressure, ("Hg)	29.60	29.60	29.60	29.60	29.60	29.60
Ambient Temperature, (F)	71	71	71	71	71	71
Pump Vacuum, ("Hg)	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	5.535	5.530	7.368	7.331	8.682	8.660
Standard Volume of Critical Orifice, (Vcrstd)	5.575	5.575	7.337	7.337	8.677	8.677
DGM Calibration Factor, (Y)	1.007	1.008	0.996	1.001	0.999	1.002
Delta H@	1.927	1.925	2.014	2.006	1.984	1.977

Average Y =	1.002
Reference Yd =	1.002
Percent Difference =	-0.069
Average Delta H@ =	1.972
STD=	0.00448

3 pt.calibration passes ✓ does not pass ____ 3% criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture: _____

Radian Source Sampling Temperature Readout Calibration Form
Per Reference EMSOP001

Operator RVW
Date 11-05-99

Readout ID Number A161365
Thermometer ID Number 2N7177
Voltage Generator ID Number A178550

Temperature Readout Calibration	
Thermometer (°F)	Temperature Readout (°F) (after adjustment)
32.2	32

Temperature Readout Calibration Check

Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference[1]	Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference
1	0.0	32	32	0	5	-1.0	-10	-14	4
	1.0	77	77	0		0.0	32	32	0
	3.0	165	165	0		1.0	77	76	1
	7.0	341	341	0		2.0	121	121	0
	15.0	692	692	0		3.0	165	164	1
2	0.0	32	32	0	6	-1.0	-10	-12	2
	3.0	165	165	0		0.0	32	32	0
	4.0	208	208	0		1.0	77	76	1
	5.0	251	251	0		2.0	121	121	0
	7.0	341	341	0		3.0	165	164	1
3	0.0	32	32	0	7	-1.0	-10	-12	2
	3.0	165	164	1		0.0	32	32	0
	4.0	208	209	1		1.0	77	76	1
	5.0	251	252	1		2.0	121	121	0
	7.0	341	342	1		3.0	165	164	1
4	-1.0	-10	-14	4					
	0.0	32	32	0					
	1.0	77	77	0					
	2.0	121	122	1					
	3.0	165	165	0					

RVW

[1] Acceptable difference is ±5°F for temperatures below 1000°F and ±10° for temperatures

Five Point Console Dry Gas Meter Calibration Form

Console ID: A161365 Pump ID: — Date: 11-05-99 Signature: [illegible]

Dry Gas Meter		Run 1A	Run 1B	Run 2A	Run 2B	Run 3A	Run 3B	Run 4A	Run 4B	Run 5A	Run 5B
Orifice Identification Code		A175936		A175935		A175932		A175933		A175934	
Orifice K Factor		0.2603		0.4340		0.5712		0.6755		0.8576	
Initial Reading (ft³)		743.933	747.432	750.931	756.711	665.000	672.513	680.040	688.953	697.923	720.898
Final Reading (ft³)		747.432	750.931	756.711	762.519	672.513	680.040	688.953	697.923	720.898	743.933
Meter Temp. (°F)	Initial Inlet	104	97	96	99	83	87	91	94	96	99
	Initial Outlet	92	91	90	91	75	77	78	81	83	87
	Final Inlet	98	96	99	100	87	91	94	96	99	105
	Final Outlet	92	90	91	93	77	78	81	83	87	92
Test Time (minutes)		10	10	10	10	10	10	10	10	20	20
Orifice Manometer, ΔH (" H_2O)		0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.6	4.6
Barometric Pressure ("Hg)		29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature (°F)		77	77	77	77	77	77	77	77	77	77
Pump Vacuum ("Hg)		18	18			18	18	18	18	17	17
DGM Calibration Factor (Y)		1.012	1.006	1.015	1.013	1.000	1.004	1.006	1.004	0.995	1.001
Calibration ΔH@		1.763	1.772	1.900	1.894	2.002	1.992	1.969	1.960	2.081	2.064

Avg. $Y_{previous}$ = 1.008 Avg. $Y_{current}$ = 1.006 % Difference = -0.238 Avg. ΔH@ = 1.940

Notes: NEW SEMI-ANNUAL SPH.
NO ADJUSTMENT NEEDED.
RVW

5 Point Console Calibration

Console ID: A16365
Date: 11/05/99

Orifice ID:	A175936	A175935	A175932	A175933	A175934
Orifice K':	0.2603	0.4340	0.5712	0.6755	0.8576

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b	Run #4a	Run #4b	Run #5a	Run #5b
Initial Reading, (ft3)	743.933	747.432	750.931	756.711	665.000	672.513	680.040	688.953	697.923	720.898
Final Reading, (ft3)	747.432	750.931	756.711	762.519	672.513	680.040	688.953	697.923	720.898	743.933
Difference, (ft3)	3.499	3.499	5.780	5.808	7.513	7.527	8.913	8.970	22.975	23.035
Initial Meter Inlet Temp., (F)	104	97	96	99	83	87	91	94	96	99
Initial Meter Outlet Temp., (F)	92	91	90	91	75	77	78	81	83	87
Final Meter Inlet Temp., (F)	98	96	99	100	87	91	94	96	99	105
Final Meter Outlet Temp., (F)	92	90	91	93	77	78	81	83	87	92
Average Meter Temp., (F)	96.5	93.5	94.0	95.8	80.5	83.3	86.0	88.5	91.3	95.8
Test Time (min.)	10	10	10	10	10	10	10	10	20	20
Orifice Manometer Reading, ('H2O)	0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.6	4.6
Barometric Pressure, ("Hg)	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature, (F)	77	77	77	77	77	77	77	77	77	77
Pump Vacuum, ("Hg)	18	18	18	18	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	3.300	3.318	5.486	5.496	7.325	7.301	8.618	8.634	22.106	21.984
Standard Volume of Critical Orifice, (Vcrstd)	3.340	3.340	5.568	5.568	7.328	7.328	8.666	8.666	22.005	22.005
DGM Calibration Factor, (Y)	1.012	1.006	1.015	1.013	1.000	1.004	1.006	1.004	0.995	1.001
Delta H@	1.763	1.772	1.900	1.894	2.002	1.992	1.969	1.960	2.081	2.064

Current Average Y = 1.006
Previous Average Y = 1.008
Percent Difference = -0.238
Average Delta H@ = 1.940
@STD= 0.0058

5 pt. calibration passes ✓ does not pass ____ 0.950 to 1.050 criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture= RVW

Pre ✓ Post ___ Test Console Calibration Check

Console ID: A161365
Date: 11/05/99

Orifice ID:	A175935	A175932	A175933
Orifice K':	0.4340	0.5712	0.6755

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b
Initial Reading, (ft3)	750.931	756.711	665.000	672.513	680.040	688.953
Final Reading, (ft3)	756.711	762.519	672.513	680.040	688.953	697.923
Difference, (ft3)	5.780	5.808	7.513	7.527	8.913	8.970
Initial Meter Inlet Temp., (F)	96	99	83	87	91	94
Initial Meter Outlet Temp., (F)	90	91	75	77	78	81
Final Meter Inlet Temp., (F)	99	100	87	91	94	96
Final Meter Outlet Temp., (F)	91	93	77	78	81	83
Average Meter Temp., (F)	94.0	95.8	80.5	83.3	86.0	88.5
Test Time (min.)	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	1.1	1.1	1.95	1.95	2.7	2.7
Barometric Pressure, ("Hg)	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature, (F)	77	77	77	77	77	77
Pump Vacuum, ("Hg)	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	5.486	5.496	7.325	7.301	8.618	8.634
Standard Volume of Critical Orifice, (Vcrstd)	5.568	5.568	7.328	7.328	8.666	8.666
DGM Calibration Factor, (Y)	1.015	1.013	1.000	1.004	1.006	1.004
Delta H@	1.900	1.894	2.002	1.992	1.969	1.960

Average Y =	1.007
Reference Yd =	1.006
Percent Difference =	-0.130
Average Delta H@ =	1.953
STD=	0.004753

3 pt.calibration passes ✓ does not pass ___ 3% criteria.
Specified by SPO Ref: 8
CAR submitted ___ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture: _____

Radian Source Sampling Temperature Readout Calibration Form

Per Reference EMSOP001

Operator RVW
Date 09-08-99

Readout ID Number A161397
Thermometer ID Number 2N7177
Voltage Generator ID Number A178550

Temperature Readout Calibration	
Thermometer (°F)	Temperature Readout (°F) (after adjustment)
32.2	32

Temperature Readout Calibration Check

Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference	Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference
1	0.0	32	32	0	5	-1.0	-10	-12	2
	1.0	77	77	0		0.0	32	32	0
	3.0	165	165	0		1.0	77	76	1
	7.0	341	341	0		2.0	121	122	1
	15.0	692	692	0		3.0	165	164	1
2	0.0	32	32	0	6	-1.0	-10	-12	2
	3.0	165	165	0		0.0	32	32	0
	4.0	208	208	0		1.0	77	76	1
	5.0	251	251	0		2.0	121	121	0
	7.0	341	341	0		3.0	165	165	0
3	0.0	32	32	0	7	-1.0	-10	-13	3
	3.0	165	165	0		0.0	32	32	0
	4.0	208	208	0		1.0	77	77	0
	5.0	251	251	0		2.0	121	121	0
	7.0	341	341	0		3.0	165	165	0
4	-1.0	-10	-12	2					
	0.0	32	32	0					
	1.0	77	76	1					
	2.0	121	121	0					
	3.0	165	165	0					

Acceptable difference is ±5°F for temperatures below 1000°F and ±10° for temperatures

Five Point Console Dry Gas Meter Calibration Form

Console ID: A16139 67 (Rev) Pump ID: ——— Date: 09-08-99 Signature: [signature]

Dry Gas Meter		Run 1A	Run 1B	Run 2A	Run 2B	Run 3A	Run 3B	Run 4A	Run 4B	Run 5A	Run 5B
Orifice Identification Code		A175936		A175935		A175932		A175933		A175934	
Orifice K Factor		0.2603		0.4340		0.5712 ~~0.4340~~		0.6755 ~~0.5712~~		0.8576	
Initial Reading (ft³)		651.000	654.535	658.063	663.943	669.820	677.522	685.264	694.404	703.560	715.210
Final Reading (ft³)		654.535	658.063	663.943	669.820	677.522	685.264	694.404	703.560	715.210	726.881
Meter Temp. (°F)	Initial Inlet	89	86	85	85	85	86	87	89	90	93
	Initial Outlet	89	89	83	82	82	81	81	82	83	83
	Final Inlet	86	85	85	85	86	87	89	90	93	95
	Final Outlet	89	83	82	82	81	81	82	83	83	85
Test Time (minutes)		10	10	10	10	10	10	10	10	10	10
Orifice Manometer, ΔH ("H_2O)		0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.5	4.5
Barometric Pressure ("Hg)		29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35
Ambient Temperature (°F)		77	77	77	77	77	77	77	77	77	77
Pump Vacuum ("Hg)		18	18	18	18	17	17	16	16	15	15
DGM Calibration Factor (Y)		0.982	0.982	0.979	0.979	0.981	0.977	0.978	0.979	0.975	0.976
Calibration ΔH@		1.821	1.825	1.961	1.962	2.017	2.016	2.000	1.995	2.077	2.070

Avg. $Y_{previous}$ = 0.999 Avg. $Y_{current}$ = 0.979 % Difference = 2.067 Avg. ΔH@ = 1.974

Notes: NEW SEMI ANNUAL 5pt

ORIFICE CALIBRATION

5 Point Console Calibration

Console ID: A161397
Date: 09/08/99

Orifice ID:	A175936	A175935	A175932	A175933	A175934
Orifice K':	0.2603	0.4340	0.5712	0.6755	0.8576

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b	Run #4a	Run #4b	Run #5a	Run #5b
Initial Reading, (ft3)	651.000	654.535	658.063	663.943	669.820	677.522	685.264	694.404	703.560	715.210
Final Reading, (ft3)	654.535	658.063	663.943	669.820	677.522	685.264	694.404	703.560	715.210	726.881
Difference, (ft3)	3.535	3.528	5.880	5.877	7.702	7.742	9.140	9.156	11.650	11.671
Initial Meter Inlet Temp., (F)	89	86	85	85	85	86	87	89	90	93
Initial Meter Outlet Temp., (F)	84	84	83	82	82	81	81	82	83	83
Final Meter Inlet Temp., (F)	86	85	85	85	86	87	89	90	93	95
Final Meter Outlet Temp., (F)	84	83	82	82	81	81	82	83	83	85
Average Meter Temp., (F)	85.8	84.5	83.8	83.5	83.5	83.8	84.8	86.0	87.3	89.0
Test Time (min.)	10	10	10	10	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.5	4.5
Barometric Pressure, ("Hg)	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35	29.35
Ambient Temperature, (F)	77	77	77	77	77	77	77	77	77	77
Pump Vacuum, ("Hg)	18	18	18	18	18	18	16	16	15	15
Standard Volume of the Meter, (Vmstd)	3.357	3.358	5.614	5.614	7.373	7.408	8.745	8.741	11.146	11.130
Standard Volume of Critical Orifice, (Vcrstd)	3.297	3.297	5.497	5.497	7.235	7.235	8.556	8.556	10.862	10.862
DGM Calibration Factor, (Y)	0.982	0.982	0.979	0.979	0.981	0.977	0.978	0.979	0.975	0.976
Delta H@	1.821	1.825	1.961	1.962	2.017	2.016	2.000	1.995	2.077	2.070

Current Average Y = 0.979
Previous Average Y = 0.999
Percent Difference = -2.067
Average Delta H@ = 1.974
@STD= 0.0024

5 pt. calibration passes ✓ does not pass ____ 0.950 to 1.050 criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture=

Pre ✓ Post___ Test Console Calibration Check

Console ID: A161397
Date: 09/21/99

Orifice ID:	A175935	A175932	A175933
Orifice K':	0.434	0.5712	0.6755

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b
Initial Reading, (ft3)	658.063	663.943	669.820	677.522	685.264	694.404
Final Reading, (ft3)	663.943	669.820	677.522	685.264	694.404	703.560
Difference, (ft3)	5.880	5.877	7.702	7.742	9.140	9.156
Initial Meter Inlet Temp., (F)	85	85	85	86	87	89
Initial Meter Outlet Temp., (F)	83	82	82	81	81	82
Final Meter Inlet Temp., (F)	85	85	86	87	89	90
Final Meter Outlet Temp., (F)	82	82	81	81	82	83
Average Meter Temp., (F)	83.8	83.5	83.5	83.8	84.8	86.0
Test Time (min.)	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	1.1	1.1	1.95	1.95	2.7	2.7
Barometric Pressure, ("Hg)	29.35	29.35	29.35	29.35	29.35	29.35
Ambient Temperature, (F)	77	77	77	77	77	77
Pump Vacuum, ("Hg)	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	5.614	5.614	7.373	7.408	8.745	8.741
Standard Volume of Critical Orifice, (Vcrstd)	5.497	5.497	7.235	7.235	8.556	8.556
DGM Calibration Factor, (Y)	0.979	0.979	0.981	0.977	0.978	0.979
Delta H@	1.961	1.962	2.017	2.016	2.000	1.995

Average Y =	0.979
Reference Yd =	0.979
Percent Difference =	-0.011
Average Delta H@ =	1.992
STD=	0.001667

3 pt.calibration passes ✓ does not pass ____ 3% criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RW

Signiture: [signature]

Pre____ or Post____ Test Console DGM & Thermocouple Calibration Form

Console I.D. A161397 Date 11-03-99 Signature [illegible]

Dry Gas Meter Cal.		Run 1A	Run 1B	Run 2A	Run 2B	Run 3A	Run 3B
Orifice I.D.		A175935		A175932		A175933	
Orifice K-Factor		0.4340		0.5712		0.6755	
Initial Vol. (ft^3)		225.000	230.848	236.714	246.000	255.328	264.570
Final Vol. (ft^3)		230.848	236.714	246.000	255.328	264.570	273.822
T_{meter} (°F)	$Inlet_{init}$	82	86	89	92	95	96
	$Outlet_{init.}$	78	78	80	82	84	86
	$Inlet_{final}$	86	89	92	95	96	97
	$Outlet_{final}$	78	80	82	84	86	86
Test Duration, (Min.)		10	10	12	12	10	10
Orifice ΔH, ("H_2O)		1.1	1.1	1.95	1.95	2.7	2.7
P_{bar}, ("Hg)		29.75	29.75	29.75	29.75	29.75	29.75
$T_{ambient}$, (°F)		73	73	73	73	73	73
Pump Vacuum, ("Hg)		18	18	18	18	18	18
Calculated Values							
DGM Corr. Factor, Y		0.983	0.984	0.984	0.984	0.981	0.982
DGM Cal. ΔH@		1.930	1.922	1.966	1.957	1.938	1.935

Avg. $Y_{ref.}$= 0.979 Avg. $Y_{cal.}$= 0.983 %Difference= -0.451 Avg. ΔH@= 1.941

Thermocouple Cal. NIST Thermometer I.D. 2N7177

NIST Voltage Supply I.D. A178550

Check the temperature readout against the NIST thermometer	Thermometer Reading (°F) 72.6	Thermocouple Readout 73	Channel No.	1
			Temp (°F)	73
Check the temperature readout linearity (one channel only)	Channel No. 2	Voltage		1.0
		Theoretical °F		77
		Observed Temp (°F)		77

Pre ✓ Post___ Test Console Calibration Check

Console ID: A161397
Date: 11/03/99

Orifice ID:	A175935	A175932	A175933
Orifice K':	0.4340	0.5712	0.6755

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b
Initial Reading, (ft3)	225.000	230.848	236.714	246.000	255.328	264.570
Final Reading, (ft3)	230.848	236.714	246.000	255.328	264.570	273.822
Difference, (ft3)	5.848	5.866	9.286	9.328	9.242	9.252
Initial Meter Inlet Temp., (F)	82	86	89	92	95	96
Initial Meter Outlet Temp., (F)	78	78	80	82	84	86
Final Meter Inlet Temp., (F)	86	89	92	95	96	97
Final Meter Outlet Temp., (F)	78	80	82	84	86	86
Average Meter Temp., (F)	81.0	83.3	85.8	88.3	90.3	91.3
Test Time (min.)	10	10	12	12	10	10
Orifice Manometer Reading, ('H2O)	1.1	1.1	1.95	1.95	2.7	2.7
Barometric Pressure, ("Hg)	29.75	29.75	29.75	29.75	29.75	29.75
Ambient Temperature, (F)	73	73	73	73	73	73
Pump Vacuum, ("Hg)	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	5.688	5.682	8.972	8.972	8.873	8.867
Standard Volume of Critical Orifice, (Vcrstd)	5.593	5.593	8.833	8.833	8.705	8.705
DGM Calibration Factor, (Y)	0.983	0.984	0.984	0.984	0.981	0.982
Delta H@	1.930	1.922	1.966	1.957	1.938	1.935

Average Y =	0.983
Reference Yd =	0.979
Percent Difference =	-0.451
Average Delta H@ =	1.941
STD=	0.001681

3 pt.calibration passes ✓ does not pass ____ 3% criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture: RVW

Radian Source Sampling Temperature Readout Calibration Form
Per Reference EMSOP001

Operator RVW
Date 11-05-99

Readout ID Number A161365 401 RVW
Thermometer ID Number 2N7177
Voltage Generator ID Number A178550

Temperature Readout Calibration	
Thermometer (°F)	Temperature Readout (°F) (after adjustment)
31.8	32

Temperature Readout Calibration Check

Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference
1	0.0	32	32	0
	1.0	77	76	1
	3.0	165	164	1
	7.0	341	340	1
	15.0	692	691	1
2	0.0	32	32	0
	3.0	165	165	0
	4.0	208	209	1
	5.0	251	253	2
	7.0	341	342	1
3	0.0	32	32	0
	3.0	165	165	0
	4.0	208	208	0
	5.0	251	252	1
	7.0	341	342	1
4	-1.0	-10	-14	4
	0.0	32	32	0
	1.0	77	77	0
	2.0	121	121	0
	3.0	165	166	1

Channel	Voltage (mV)	Temperature (°F) Theoretical	Observed	Difference
5	-1.0	-10	-12	2
	0.0	32	32	0
	1.0	77	76	1
	2.0	121	121	0
	3.0	165	164	1
6	-1.0	-10	-13	3
	0.0	32	32	0
	1.0	77	76	1
	2.0	121	120	1
	3.0	165	165	0
7	-1.0	-10	-12	2
	0.0	32	32	0
	1.0	77	77	0
	2.0	121	121	0
	3.0	165	164	1

RVW

Acceptable difference is ±5°F for temperatures below 1000°F and ±10° for temperatures

Five Point Console Dry Gas Meter Calibration Form

Console ID: A161401 Pump ID: — Date: 11-05-99 Signature: [illegible]

Dry Gas Meter		Run 1A	Run 1B	Run 2A	Run 2B	Run 3A	Run 3B	Run 4A	Run 4B	Run 5A	Run 5B
Orifice Identification Code		A175936		A175932		A175932		A175933		A175934	
Orifice K Factor		0.2603		0.4390		0.5712		0.6755		0.8576	
Initial Reading (ft³)		81.450	84.985	88.513	94.365	25.000	32.522	40.100	49.130	58.209	69.807
Final Reading (ft³)		84.985	88.513	94.365	100.222	32.522	40.100	49.130	58.209	69.807	81.450
Meter Temp. (°F)	Initial Inlet	97	90	89	90	77	80	83	87	90	93
	Initial Outlet	83	84	84	84	74	74	76	77	79	80
	Final Inlet	90	89	90	91	80	83	87	90	93	97
	Final Outlet	84	84	84	85	74	76	77	79	80	83
Test Time (minutes)		10	10	10	10	10	10	10	10	10	10
Orifice Manometer, ΔH (" H_2O)		0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.4	4.4
Barometric Pressure ("Hg)		29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature (°F)		75	75	75	75	75	75	75	75	75	75
Pump Vacuum ("Hg)		18	18	18	18	18	18	18	18	16	16
DGM Calibration Factor (Y)		0.989	0.988	0.991	0.992	0.993	0.990	0.985	0.985	0.978	0.979
Calibration ΔH@		1.782	1.787	1.918	1.916	2.010	2.003	1.981	1.972	~~2.048~~	RVW

Avg. $Y_{previous}$ = 1.000 Avg. $Y_{current}$ = 0.987 % Difference = -1.334 Avg. ΔH@ = 1.936 2.002 1.992

Notes: NEW Semi-ANNUAL Spt.

NO ADJUSTMENT NEEDED.

RVW

5 Point Console Calibration

Console ID: A161401
Date: 11/05/99

Orifice ID:	A175936	A175935	A175932	A175933	A175934
Orifice K':	0.2603	0.4340	0.5712	0.6755	0.8576

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b	Run #4a	Run #4b	Run #5a	Run #5b
Initial Reading, (ft3)	81.450	84.985	88.513	94.365	25.000	32.522	40.100	49.130	58.204	69.807
Final Reading, (ft3)	84.985	88.513	94.365	100.222	32.522	40.100	49.130	58.204	69.807	81.450
Difference, (ft3)	3.535	3.528	5.852	5.857	7.522	7.578	9.030	9.074	11.603	11.643
Initial Meter Inlet Temp., (F)	97	90	89	90	77	80	83	87	90	93
Initial Meter Outlet Temp., (F)	83	84	84	84	74	74	76	77	79	80
Final Meter Inlet Temp., (F)	90	89	90	91	80	83	87	90	93	97
Final Meter Outlet Temp., (F)	84	84	84	85	74	76	77	79	80	83
Average Meter Temp., (F)	88.5	86.8	86.8	87.5	76.3	78.3	80.8	83.3	85.5	88.3
Test Time (min.)	10	10	10	10	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	0.37	0.37	1.1	1.1	1.95	1.95	2.7	2.7	4.4	4.4
Barometric Pressure, ("Hg)	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature, (F)	75	75	75	75	75	75	75	75	75	75
Pump Vacuum, ("Hg)	18	18	18	18	18	18	18	18	16	16
Standard Volume of the Meter, (Vmstd)	3.383	3.387	5.628	5.626	7.392	7.419	8.816	8.818	11.276	11.258
Standard Volume of Critical Orifice, (Vcrstd)	3.346	3.346	5.578	5.578	7.342	7.342	8.682	8.682	11.023	11.023
DGM Calibration Factor, (Y)	0.989	0.988	0.991	0.992	0.993	0.990	0.985	0.985	0.978	0.979
Delta H@	1.782	1.787	1.918	1.916	2.010	2.003	1.981	1.972	2.002	1.992

Current Average Y = 0.987
Previous Average Y = 1.000
Percent Difference = -1.334
Average Delta H@ = 1.936
@STD= 0.0050

5 pt. calibration passes ✓ does not pass ____ 0.950 to 1.050 criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture=

Pre ✓ Post___ Test Console Calibration Check

Console ID: A161401
Date: 11/05/99

Orifice ID:	A175935	A175932	A175933
Orifice K':	0.4340	0.5712	0.6755

Dry Gas Meter	Run #1a	Run #1b	Run #2a	Run #2b	Run #3a	Run #3b
Initial Reading, (ft3)	88.513	94.365	25.000	32.522	40.100	49.130
Final Reading, (ft3)	94.365	100.222	32.522	40.100	49.130	58.204
Difference, (ft3)	5.852	5.857	7.522	7.578	9.030	9.074
Initial Meter Inlet Temp., (F)	89	90	77	80	83	87
Initial Meter Outlet Temp., (F)	84	84	74	74	76	77
Final Meter Inlet Temp., (F)	90	91	80	83	87	90
Final Meter Outlet Temp., (F)	84	85	74	76	77	79
Average Meter Temp., (F)	86.8	87.5	76.3	78.3	80.8	83.3
Test Time (min.)	10	10	10	10	10	10
Orifice Manometer Reading, ('H2O)	1.1	1.1	1.95	1.95	2.7	2.7
Barometric Pressure, ("Hg)	29.73	29.73	29.73	29.73	29.73	29.73
Ambient Temperature, (F)	75	75	75	75	75	75
Pump Vacuum, ("Hg)	18	18	18	18	18	18
Standard Volume of the Meter, (Vmstd)	5.628	5.626	7.392	7.419	8.816	8.818
Standard Volume of Critical Orifice, (Vcrstd)	5.578	5.578	7.342	7.342	8.682	8.682
DGM Calibration Factor, (Y)	0.991	0.992	0.993	0.990	0.985	0.985
Delta H@	1.918	1.916	2.010	2.003	1.981	1.972

Average Y =	0.989
Reference Yd =	0.987
Percent Difference =	-0.236
Average Delta H@ =	1.967
STD=	0.003924

3 pt.calibration passes ✓ does not pass ____ 3% criteria.
Specified by SPO Ref: 8
CAR submitted ____ not submitted ✓
Notified N/A Operator's initial's RVW

Signiture: [signature]

APPENDIX F

Bypass Flow Percentage Example Calculation

Bypass Percentage Calculation

At Limestone Unit 1, 4 absorber modules (with a fifth spare) are used to scrub the flue gas to meet the SO_2 emission limit. A small fraction of the entering gas can bypass the absorbers, providing reheat. Temperature measurements made at the inlet and outlet of the absorber and in the stack provide a means of calculating the bypass gas percentage.

As an example, during run 1, the inlet gas temperature (which is also the bypass gas) was 313°F. The tested absorber outlet was 139°F and the stack was at 146°F. Making the following assumptions, the bypass percentage can be calculated:

- All four mudules have the same exit temperature;
- The heat capacity of the "dry" and "wet" gas streams is the same; and,
- External heat losses are minimal.

A simple heat balance then states that the energy of the scrubbed gas plus the bypass gas equals the stack gas. Mathematically, this is represented as follows:

$$X(313°F) + (1-X)(139°F) = 146°F$$

Where X = fraction of gas bypassed.

For this set of temperatures, X = 0.040 or 4% bypass.