APPENDIX A
DETAILED TEST DATA AND TEST RESULTS

TABLE A-1
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 2-INLET

TEST DATA:				
Test run number	1	2	3	
Location		Unit 2 Inlet		
Test date	3/23/00	3/24/00	3/24/00	
Test time period	1245-1508	0820-1040	1230-1445	
PROCESS DATA:				
Unit Load, MW	56.5	56.7	56.7	
Coal feed rate, lb/hr.	64520	64760	64760	
Coal Btu content, Btu/lb.(as received)	8924	8884	8906	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	623.4	579.3	572.0	
SAMPLING DATA:				
Sampling duration, min.	125.0	125.0	125.0	
Nozzle diameter, in.	0.275	0.275	0.275	
Cross sectional nozzle area, sq.ft.	0.000412	0.000412	0.000412	
Barometric pressure, in. Hg	28.70	28.29	28.20	
Avg. orifice press. diff., in H_2O	1.21	1.48	1.36	
Avg. dry gas meter temp., deg F	89.4	78.0	84.3	
Avg. abs. dry gas meter temp., deg. R	549	538	544	
Total liquid collected by train, ml	176.8	191.6	203.5	
Std. vol. of H_2O vapor coll., cu.ft.	8.3	9.0	9.6	
Dry gas meter calibration factor	1.0072	1.0072	1.0072	
Sample vol. at meter cond., dcf	76.043	82.593	80.683	
Sample vol. at std. cond., dscf (1)	70.797	77.459	74.532	
Percent of isokinetic sampling	101.3	99.4	102.2	
Sample vol. at std. cond., dscm (1)	2.005	2.193	2.111	
GAS STREAM COMPOSITION DATA:				
CO_2, % by volume, dry basis	13.6	13.1	13.4	
O_2, % by volume, dry basis	6.0	6.7	6.4	
N_2, % by volume, dry basis	80.4	80.2	80.2	
Molecular wt. of dry gas, lb/lb mole	30.42	30.37	30.40	
H_20 vapor in gas stream, prop. by vol.	0.105	0.104	0.114	
Mole fraction of dry gas	0.895	0.896	0.886	
Molecular wt. of wet gas, lb/lb mole	29.11	29.08	28.99	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:				
Static pressure, in. H_2O	-11.00	-11.40	-11.50	
Absolute pressure, in. Hg	27.89	27.45	27.35	
Avg. temperature, deg. F	354	343	347	
Avg. absolute temperature, deg.R	814	803	807	
Pitot tube coefficient	0.84	0.84	0.84	
Total number of traverse points	25	25	25	
Avg. gas stream velocity, ft./sec.	41.8	46.6	44.5	
Stack/duct cross sectional area, sq.ft.	104.500	104.500	104.500	AVERAGE
Avg. gas stream volumetric flow, wacf/min.	261814	292470	279020	277768
Avg. gas stream volumetric flow, dscf/min. (1)	141617	157978	147815	149137
MERCURY LABORATORY REPORT DATA:				
Particulate bound, ug	4.5891	3.4591	1.4046	
Oxidized, ug	3.0250	2.1867	1.9700	
Elemental, ug	2.6600	2.5533	4.2717	
Total catch, ug	10.2741	8.1991	7.6463	
PARTICULATE BOUND MERCURY EMISSIONS:				
Conc., ug/m^3	2.29	1.58	0.67	1.51
Conc., ug/Nm^3 (2)	2.46	1.69	0.71	1.62
Emission rate, lbs/10^{12} Btu.	1.95	1.61	0.64	1.40
Emission rate, lbs/hr.	1.21E-03	9.33E-04	3.68E-04	8.39E-04
OXIDIZED MERCURY EMISSIONS:				
Conc., ug/m^3	1.51	1.00	0.93	1.15
Conc., ug/Nm^3 (2)	1.62	1.07	1.00	1.23
Emission rate, lbs/10^{12} Btu.	1.28	1.02	0.90	1.07
Emission rate, lbs/hr.	8.00E-04	5.90E-04	5.17E-04	6.36E-04
ELEMENTAL MERCURY EMISSIONS:				
Conc., ug/m^3	1.33	1.16	2.02	1.51
Conc., ug/Nm^3 (2)	1.42	1.25	2.17	1.61
Emission rate, lbs/10^{12} Btu.	1.13	1.19	1.96	1.43
Emission rate, lbs/hr.	7.04E-04	6.89E-04	1.12E-03	8.38E-04
TOTAL MERCURY EMISSIONS:				
Conc., ug/m^3	5.13	3.74	3.62	4.16
Conc., ug/Nm^3 (2)	5.50	4.01	3.89	4.47
Emission rate, lbs/10^{12} Btu.	4.36	3.82	3.51	3.90
Emission rate, lbs/hr.	2.72E-03	2.21E-03	2.01E-03	2.31E-03

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).

TABLE A-2
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 2-OUTLET

TEST DATA:					
Test run number	1	2		3	
Location		Unit 2 Outlet			
Test date	3/23/00	3/24/00		3/24/00	
Test time period	1245-1507	0821-1038		1230-1444	
PROCESS DATA:					
Unit Load, MW	56.5	56.7		56.7	
Coal feed rate, lb/hr.	64520	64760		64760	
Coal Btu content, Btu/lb.(as received)	8924	8884		8906	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	623.4	579.3		572.0	
SAMPLING DATA:					
Sampling duration, min.	120.0	120.0		120.0	
Nozzle diameter, in.	0.270	0.270		0.270	
Cross sectional nozzle area, sq.ft.	0.000398	0.000398		0.000398	
Barometric pressure, in. Hg	28.70	28.26		28.20	
Avg. orifice press. diff., in H_2O	1.30	1.20		1.19	
Avg. dry gas meter temp., deg F	73.2	62.2		63.9	
Avg. abs. dry gas meter temp., deg. R	533	522		524	
Total liquid collected by train, ml	177.4	177.9		190.3	
Std. vol. of H_2O vapor coll., cu.ft.	8.4	8.4		9.0	
Dry gas meter calibration factor	0.9958	0.9958		0.9958	
Sample vol. at meter cond., dcf	75.845	74.537		74.139	
Sample vol. at std. cond., dscf (1)	71.948	71.074		70.315	
Percent of isokinetic sampling	101.5	104.2		105.0	
Sample vol. at std. cond., dscm (1)	2.037	2.013		1.991	
GAS STREAM COMPOSITION DATA:					
CO_2, % by volume, dry basis	13.0	12.6		12.7	
O_2, % by volume, dry basis	6.6	7.2		7.1	
N_2, % by volume, dry basis	80.4	80.2		80.2	
Molecular wt. of dry gas, lb/lb mole	30.34	30.30		30.32	
H_20 vapor in gas stream, prop. by vol.	0.104	0.105		0.113	
Mole fraction of dry gas	0.896	0.895		0.887	
Molecular wt. of wet gas, lb/lb mole	29.06	29.01		28.93	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:					
Static pressure, in. H_2O	-19.00	-18.00		-19.00	
Absolute pressure, in. Hg	27.30	26.94		26.80	
Avg. temperature, deg. F	336	331		335	
Avg. absolute temperature, deg.R	796	791		795	
Pitot tube coefficient	0.84	0.84		0.84	
Total number of traverse points	30	30		30	
Avg. gas stream velocity, ft./sec.	45.7	44.4		44.4	AVERAGE
Stack/duct cross sectional area, sq.ft.	100.000	100.000		100.000	
Avg. gas stream volumetric flow, wacf/min.	274097	266243		266146	268829
Avg. gas stream volumetric flow, dscf/min. (1)	148633	143057		140378	144022
MERCURY LABORATORY REPORT DATA:					
Particulate bound, ug	0.1200	0.0055	<	0.0020	
Oxidized, ug	2.0500	0.5350		0.8950	
Elemental, ug	0.2233	0.3600		0.1850	
Total mercury catch, ug	2.3933	0.9005		1.0800	
PARTICULATE BOUND MERCURY EMISSIONS:					
Conc., ug/m^3	0.059	0.003	<	0.001	0.031
Conc., ug/Nm^3 (2)	0.063	0.003	<	0.001	0.033
Emission rate, lbs/10^{12} Btu.	5.26E-02	2.53E-03	<	9.23E-04	2.76E-02
Emission rate, lbs/hr	3.28E-05	1.46E-06	<	5.28E-07	1.71E-05
OXIDIZED MERCURY EMISSIONS:					
Conc., ug/m^3	1.01	0.27		0.45	0.57
Conc., ug/Nm^3 (2)	1.08	0.29		0.48	0.62
Emission rate, lbs/10^{12} Btu.	0.90	0.25		0.41	0.52
Emission rate, lbs/hr	5.60E-04	1.42E-04		2.36E-04	3.13E-04
ELEMENTAL MERCURY EMISSIONS:					
Conc., ug/m^3	0.11	0.18		0.09	0.13
Conc., ug/Nm^3 (2)	0.12	0.19		0.10	0.14
Emission rate, lbs/10^{12} Btu.	0.10	0.17		0.09	0.12
Emission rate, lbs/hr	6.10E-05	9.58E-05		4.89E-05	6.86E-05
TOTAL MERCURY EMISSIONS: (3)					
Conc., ug/m^3	1.17	0.45		0.54	0.72
Conc., ug/Nm^3 (2)	1.26	0.48		0.58	0.77
Emission rate, lbs/10^{12} Btu.	1.05	0.41		0.50	0.65
Emission rate, lbs/hr	6.54E-04	2.40E-04		2.85E-04	3.93E-04
TOTAL MERCURY REMOVAL EFFICIENCY:	77%	91%		89%	86%

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Non-detects not included in total mercury catch value or in average emission rates.

TABLE A-3
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 3-INLET

TEST DATA:				
Test run number	1	2	3	
Location		Unit 3 Inlet		
Test date	3/21/00	3/21/00	3/22/00	
Test time period	0902-1205	1515-1759	0835-1111	
PROCESS DATA:				
Unit Load, MW	338.0	333.0	334.0	
Coal feed rate, lb/hr.	374260	368400	369200	
Coal Btu content, Btu/lb.(as received)	8921	8641	8644	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	4217.6	4201.9	4073.3	
SAMPLING DATA:				
Sampling duration, min.	120.0	120.0	120.0	
Nozzle diameter, in.	0.307	0.315	0.315	
Cross sectional nozzle area, sq.ft.	0.000514	0.000541	0.000541	
Barometric pressure, in. Hg	28.70	28.67	28.70	
Avg. orifice press. diff., in H_2O	0.92	1.06	1.01	
Avg. dry gas meter temp., deg F	103.8	105.7	98.3	
Avg. abs. dry gas meter temp., deg. R	564	566	558	
Total liquid collected by train, ml	148.2	178.9	162.5	
Std. vol. of H_2O vapor coll., cu.ft.	7.0	8.4	7.7	
Dry gas meter calibration factor	0.9926	0.9926	0.9926	
Sample vol. at meter cond., dcf	64.783	66.431	65.863	
Sample vol. at std. cond., dscf (1)	57.878	59.110	59.437	
Percent of isokinetic sampling	105.5	101.8	103.0	
Sample vol. at std. cond., dscm (1)	1.639	1.674	1.683	
GAS STREAM COMPOSITION DATA:				
CO_2, % by volume, dry basis	14.6	14.6	14.5	
O_2, % by volume, dry basis	5.4	5.4	5.5	
N_2, % by volume, dry basis	80.0	80.0	80.0	
Molecular wt. of dry gas, lb/lb mole	30.55	30.55	30.54	
H_20 vapor in gas stream, prop. by vol.	0.108	0.125	0.114	
Mole fraction of dry gas	0.892	0.875	0.886	
Molecular wt. of wet gas, lb/lb mole	29.20	28.99	29.11	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:				
Static pressure, in. H_2O	-14.80	-14.60	-14.40	
Absolute pressure, in. Hg	27.61	27.60	27.64	
Avg. temperature, deg. F	283	299	292	
Avg. absolute temperature, deg.R	743	759	752	
Pitot tube coefficient	0.84	0.84	0.84	
Total number of traverse points	40	40	40	
Avg. gas stream velocity, ft./sec.	22.8	23.7	22.7	
Avg. gas stream velocity, ft./sec. (isokinetic test)	25.3	26.6	25.8	
Stack/duct cross sectional area, sq.ft.	1149.5	1149.5	1149.5	AVERAGE
Avg. gas stream volumetric flow, wacf/min.	1573935	1637108	1565160	1592068
Avg. gas stream volumetric flow, dscf/min. (1)	920914	918684	899710	913103
MERCURY LABORATORY REPORT DATA:				
Particulate bound, ug	0.0206	< 0.0266	0.0844	
Oxidized, ug	0.3533	0.4600	0.9000	
Elemental, ug	8.6033	8.6950	7.5500	
Total catch, ug	8.9772	9.1550	8.5344	
PARTICULATE BOUND MERCURY EMISSIONS:				
Conc., ug/m^3	0.01	< 0.02	0.05	0.03
Conc., ug/Nm^3 (2)	0.01	< 0.02	0.05	0.03
Emission rate, lbs/10^{12} Btu.	0.01	< 0.01	0.04	0.03
Emission rate, lbs/hr.	4.34E-05	< 5.47E-05	1.69E-04	1.06E-04
OXIDIZED MERCURY EMISSIONS:				
Conc., ug/m^3	0.22	0.27	0.53	0.34
Conc., ug/Nm^3 (2)	0.23	0.29	0.57	0.37
Emission rate, lbs/10^{12} Btu.	0.18	0.23	0.44	0.28
Emission rate, lbs/hr.	7.44E-04	9.46E-04	1.80E-03	1.16E-03
ELEMENTAL MERCURY EMISSIONS:				
Conc., ug/m^3	5.25	5.20	4.49	4.98
Conc., ug/Nm^3 (2)	5.63	5.57	4.81	5.34
Emission rate, lbs/10^{12} Btu.	4.29	4.25	3.71	4.09
Emission rate, lbs/hr.	1.81E-02	1.79E-02	1.51E-02	1.70E-02
TOTAL MERCURY EMISSIONS: (3)				
Conc., ug/m^3	5.48	5.47	5.07	5.34
Conc., ug/Nm^3 (2)	5.88	5.87	5.44	5.73
Emission rate, lbs/10^{12} Btu.	4.48	4.48	4.20	4.38
Emission rate, lbs/hr.	1.89E-02	1.88E-02	1.71E-02	1.83E-02

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Non-detects not included in total mercury catch value or in average emission rates.

TABLE A-4
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 3-OUTLET

TEST DATA:					
Test run number	1		2	3	
Location			Unit 3 Outlet		
Test date	3/21/00		3/21/00	3/22/00	
Test time period	0903-1200		1516-1756	0836-1112	
PROCESS DATA:					
Unit Load, MW	338.0		333.0	334.0	
Coal feed rate, lb/hr.	374260		368400	369200	
Coal Btu content, Btu/lb.(as received)	8921		8641	8644	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	4217.6		4201.9	4073.3	
SAMPLING DATA:					
Sampling duration, min.	125.0		125.0	125.0	
Nozzle diameter, in.	0.273		0.273	0.273	
Cross sectional nozzle area, sq.ft.	0.000406		0.000406	0.000406	
Barometric pressure, in. Hg	28.70		28.67	28.70	
Avg. orifice press. diff., in H_2O	1.33		1.35	1.30	
Avg. dry gas meter temp., deg F	52.2		53.4	54.4	
Avg. abs. dry gas meter temp., deg. R	512		513	514	
Total liquid collected by train, ml	258.1		268.9	262.2	
Std. vol. of H_2O vapor coll., cu.ft.	12.2		12.7	12.3	
Dry gas meter calibration factor	0.9979		0.9979	0.9979	
Sample vol. at meter cond., dcf	80.225		80.084	79.571	
Sample vol. at std. cond., dscf (1)	79.398		78.996	78.409	
Percent of isokinetic sampling	99.6		96.9	97.3	
Sample vol. at std. cond., dscm (1)	2.248		2.237	2.220	
GAS STREAM COMPOSITION DATA:					
CO_2, % by volume, dry basis	13.8		13.4	13.0	
O_2, % by volume, dry basis	6.0		6.4	6.7	
N_2, % by volume, dry basis	80.2		80.2	80.3	
Molecular wt. of dry gas, lb/lb mole	30.45		30.40	30.35	
H_20 vapor in gas stream, prop. by vol.	0.133		0.138	0.136	
Mole fraction of dry gas	0.867		0.862	0.864	
Molecular wt. of wet gas, lb/lb mole	28.80		28.69	28.67	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:					
Static pressure, in. H_2O	-1.80		-1.80	-1.80	
Absolute pressure, in. Hg	28.57		28.54	28.57	
Avg. temperature, deg. F	124		123	123	
Avg. absolute temperature, deg.R	584		583	583	
Pitot tube coefficient	0.84		0.84	0.84	
Total number of traverse points	25		25	25	
Avg. gas stream velocity, ft./sec.	35.0		35.9	35.4	AVERAGE
Stack/duct cross sectional area, sq.ft.	452.500		452.500	452.500	
Avg. gas stream volumetric flow, wacf/min.	949501		975946	961981	962476
Avg. gas stream volumetric flow, dscf/min.(1)	957998		982042	975742	971927
MERCURY LABORATORY REPORT DATA:					
Particulate bound, ug	0.0040	<	0.0020	0.0035	
Oxidized, ug	0.0867		0.1133	0.1050	
Elemental, ug	10.9016		9.7650	9.7150	
Total mercury catch, ug	10.9923		9.8783	9.8235	
PARTICULATE BOUND MERCURY EMISSIONS:					
Conc., ug/m^3	0.002	<	0.001	0.002	0.002
Conc., ug/Nm^3 (2)	0.002	<	0.001	0.002	0.002
Emission rate, lbs/10^{12} Btu.	1.51E-03	<	7.83E-04	1.41E-03	1.46E-03
Emission rate, lbs/hr	6.38E-06	<	3.29E-06	5.76E-06	6.07E-06
OXIDIZED MERCURY EMISSIONS:					
Conc., ug/m^3	0.04		0.05	0.05	0.05
Conc., ug/Nm^3 (2)	0.04		0.05	0.05	0.05
Emission rate, lbs/10^{12} Btu.	0.03		0.04	0.04	0.04
Emission rate, lbs/hr	1.38E-04		1.86E-04	1.73E-04	1.66E-04
ELEMENTAL MERCURY EMISSIONS:					
Conc., ug/m^3	4.85		4.37	4.38	4.53
Conc., ug/Nm^3 (2)	5.20		4.68	4.69	4.86
Emission rate, lbs/10^{12} Btu.	4.13		3.82	3.93	3.96
Emission rate, lbs/hr	1.74E-02		1.61E-02	1.60E-02	1.65E-02
TOTAL MERCURY EMISSIONS: (3)					
Conc., ug/m^3	4.89		4.42	4.42	4.58
Conc., ug/Nm^3 (2)	5.25		4.74	4.75	4.91
Emission rate, lbs/10^{12} Btu.	4.16		3.87	3.97	4.00
Emission rate, lbs/hr	1.75E-02		1.62E-02	1.62E-02	1.67E-02
TOTAL MERCURY REMOVAL EFFICIENCY:	11%		19%	19%	16%

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Non-detects not included in total mercury catch value or in average emission rates.

TABLE A-5
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 4-INLET

TEST DATA:				
Test run number	1	2	3	
Location		Unit 4 Inlet		
Test date	3/27/00	3/28/00	3/28/00	
Test time period	1700-2047	0837-1202	1328-1658	
PROCESS DATA:				
Unit Load, MW	540.0	540.0	540.0	
Coal feed rate, lb/hr.	589240	589400	589400	
Coal Btu content, Btu/lb.(as received)	8851	8989	8916	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	5928.0	5834.0	5588.0	
SAMPLING DATA:				
Sampling duration, min.	120.0	120.0	120.0	
Nozzle diameter, in.	0.195	0.195	0.195	
Cross sectional nozzle area, sq.ft.	0.000207	0.000207	0.000207	
Barometric pressure, in. Hg	28.11	28.47	28.50	
Avg. orifice press. diff., in H_2O	1.08	1.01	1.03	
Avg. dry gas meter temp., deg F	45.1	46.6	46.1	
Avg. abs. dry gas meter temp., deg. R	505	507	506	
Total liquid collected by train, ml	162.2	177.5	168.7	
Std. vol. of H_2O vapor coll., cu.ft.	7.6	8.4	7.9	
Dry gas meter calibration factor	0.9926	0.9926	0.9926	
Sample vol. at meter cond., dcf	67.385	65.190	67.112	
Sample vol. at std. cond., dscf (1)	65.849	64.314	66.349	
Percent of isokinetic sampling	105.3	104.4	106.8	
Sample vol. at std. cond., dscm (1)	1.865	1.821	1.879	
GAS STREAM COMPOSITION DATA:				
CO_2, % by volume, dry basis	14.0	14.4	14.4	
O_2, % by volume, dry basis	5.6	5.2	5.2	
N_2, % by volume, dry basis	80.4	80.4	80.4	
Molecular wt. of dry gas, lb/lb mole	30.46	30.51	30.51	
H_20 vapor in gas stream, prop. by vol.	0.104	0.115	0.107	
Mole fraction of dry gas	0.896	0.885	0.893	
Molecular wt. of wet gas, lb/lb mole	29.17	29.07	29.17	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:				
Static pressure, in. H_2O	-15.00	-16.00	-15.00	
Absolute pressure, in. Hg	27.01	27.29	27.40	
Avg. temperature, deg. F	310	286	277	
Avg. absolute temperature, deg.R	770	746	737	
Pitot tube coefficient	0.84	0.84	0.84	
Total number of traverse points	24	24	24	
Avg. gas stream velocity, ft./sec.	75.5	72.2	71.1	
Stack/duct cross sectional area, sq.ft.	265.8	265.8	265.8	AVERAGE
Avg. gas stream volumetric flow, wacf/min.	1203873	1151912	1133633	1163139
Avg. gas stream volumetric flow, dscf/min. (1)	667795	658386	663816	663332
Avg. gas stream volumetric flow, dscf/min. (1)(3)	1255822	1238885	1186457	1227055
MERCURY LABORATORY REPORT DATA:				
Particulate bound, ug	0.1615	4.7789	4.5240	
Oxidized, ug	0.5250	1.7067	0.9033	
Elemental, ug	8.0500	2.3483	1.9250	
Total catch, ug (3)	8.7365	8.8339	7.3523	
PARTICULATE BOUND MERCURY EMISSIONS:				
Conc., ug/m^3	0.09	2.62	2.41	1.71
Conc., ug/Nm^3 (2)	0.09	2.82	2.58	1.83
Emission rate, lbs/10^{12} Btu.	0.07	2.09	1.91	1.36
Emission rate, lbs/hr.	4.07E-04	1.22E-02	1.07E-02	7.76E-03
OXIDIZED MERCURY EMISSIONS:				
Conc., ug/m^3	0.28	0.94	0.48	0.57
Conc., ug/Nm^3 (2)	0.30	1.01	0.52	0.61
Emission rate, lbs/10^{12} Btu.	0.22	0.75	0.38	0.45
Emission rate, lbs/hr.	1.32E-03	4.35E-03	2.14E-03	2.60E-03
ELEMENTAL MERCURY EMISSIONS:				
Conc., ug/m^3	4.32	1.29	1.02	2.21
Conc., ug/Nm^3 (2)	4.63	1.38	1.10	2.37
Emission rate, lbs/10^{12} Btu.	3.43	1.03	0.81	1.76
Emission rate, lbs/hr.	2.03E-02	5.98E-03	4.55E-03	1.03E-02
TOTAL MERCURY EMISSIONS:				
Conc., ug/m^3	4.69	4.85	3.91	4.48
Conc., ug/Nm^3 (2)	5.03	5.20	4.20	4.81
Emission rate, lbs/10^{12} Btu.	3.72	3.86	3.11	3.56
Emission rate, lbs/hr.	2.20E-02	2.25E-02	1.74E-02	2.06E-02

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Volumetric flow is from the measured volumetric flow from the isokinetic test run on the Unit 4 inlet B duct and the measured volumetric flow from the Unit 4 Inlet A duct and the ESP Reheat duct.

TABLE A-6
SUMMARY OF MERCURY SPECIATION TEST DATA AND TEST RESULTS
UNIT 4-OUTLET

TEST DATA:				
Test run number	1	2	3	
Location		Unit 4 Outlet		
Test date	3/27/00	3/28/00	3/28/00	
Test time period	1700-2046	0837-1200	1325-1658	
PROCESS DATA:				
Unit Load, MW	540.0	540.0	540.0	
Coal feed rate, lb/hr.	589240	589400	589400	
Coal Btu content, Btu/lb.(as received)	8851	8989	8916	
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	5928.0	5834.0	5588.0	
SAMPLING DATA:				
Sampling duration, min.	120.0	120.0	120.0	
Nozzle diameter, in.	0.327	0.302	0.302	
Cross sectional nozzle area, sq.ft.	0.000583	0.000497	0.000497	
Barometric pressure, in. Hg	28.11	28.47	28.50	
Avg. orifice press. diff., in H_2O	1.90	1.36	1.33	
Avg. dry gas meter temp., deg F	92.3	87.5	91.0	
Avg. abs. dry gas meter temp., deg. R	552	547	551	
Total liquid collected by train, ml	285.4	252.1	251.6	
Std. vol. of H_2O vapor coll., cu.ft.	13.4	11.9	11.8	
Dry gas meter calibration factor	1.0072	1.0072	1.0072	
Sample vol. at meter cond., dcf	92.321	78.466	76.733	
Sample vol. at std. cond., dscf (1)	83.898	72.751	70.754	
Percent of isokinetic sampling	101.8	103.9	102.5	
Sample vol. at std. cond., dscm (1)	2.376	2.060	2.004	
GAS STREAM COMPOSITION DATA:				
CO_2, % by volume, dry basis	14.4	14.2	13.8	
O_2, % by volume, dry basis	5.2	5.6	6.0	
N_2, % by volume, dry basis	80.4	80.2	80.2	
Molecular wt. of dry gas, lb/lb mole	30.51	30.50	30.45	
H_20 vapor in gas stream, prop. by vol.	0.138	0.140	0.143	
Mole fraction of dry gas	0.862	0.860	0.857	
Molecular wt. of wet gas, lb/lb mole	28.78	28.74	28.66	
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:				
Static pressure, in. H_2O	0.43	0.69	0.74	
Absolute pressure, in. Hg	28.14	28.52	28.55	
Avg. temperature, deg. F	153	154	157	
Avg. absolute temperature, deg.R	613	614	617	
Pitot tube coefficient	0.84	0.84	0.84	
Total number of traverse points	12	12	12	
Avg. gas stream velocity, ft./sec.	28.1	27.8	27.5	AVERAGE
Stack/duct cross sectional area, sq.ft.	1094.640	1094.640	1094.640	
Avg. gas stream volumetric flow, wacf/min.	1847659	1823463	1809280	1826801
Avg. gas stream volumetric flow, dscf/min. (1)	1289722	1284740	1266260	1280241
MERCURY LABORATORY REPORT DATA:				
Particulate bound, ug	0.0490	0.3500	0.4660	
Oxidized, ug	0.2250	0.7800	0.9733	
Elemental, ug	11.5250	10.3867	9.2900	
Total mercury catch, ug	11.7990	11.5167	10.7293	
PARTICULATE BOUND MERCURY EMISSIONS:				
Conc., ug/m^3	0.021	0.170	0.233	0.141
Conc., ug/Nm^3 (2)	0.022	0.182	0.250	0.151
Emission rate, lbs/10^{12} Btu.	0.017	0.140	0.197	0.118
Emission rate, lbs/hr	9.96E-05	8.18E-04	1.10E-03	6.73E-04
OXIDIZED MERCURY EMISSIONS:				
Conc., ug/m^3	0.09	0.38	0.49	0.32
Conc., ug/Nm^3 (2)	0.10	0.41	0.52	0.34
Emission rate, lbs/10^{12} Btu.	0.08	0.31	0.41	0.27
Emission rate, lbs/hr	4.58E-04	1.82E-03	2.30E-03	1.53E-03
ELEMENTAL MERCURY EMISSIONS:				
Conc., ug/m^3	4.85	5.04	4.64	4.84
Conc., ug/Nm^3 (2)	5.20	5.41	4.97	5.20
Emission rate, lbs/10^{12} Btu.	3.95	4.16	3.94	4.02
Emission rate, lbs/hr	2.34E-02	2.43E-02	2.20E-02	2.32E-02
TOTAL MERCURY EMISSIONS:				
Conc., ug/m^3	4.97	5.59	5.36	5.30
Conc., ug/Nm^3 (2)	5.33	6.00	5.75	5.69
Emission rate, lbs/10^{12} Btu.	4.05	4.61	4.55	4.40
Emission rate, lbs/hr	2.40E-02	2.69E-02	2.54E-02	2.54E-02
TOTAL MERCURY REMOVAL EFFICIENCY:	ND	ND	ND	ND(3)

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nm3 = Normal cubic meter (32 deg. F. (0 deg. C.) and 29.92 inches Hg (760mm Hg)).
(3) Removal efficiency could not be determined.

Table A-7
Minnesota Power Clay Boswell Station
Unit #2 Mercury Material Balance Closures
(Overhead Ash Rate Forced to 60%)

	TEST 1	TEST 2	TEST 3	AVG
UNIT DATA:				
Flue Gas DSCFM	148633	143057	140378	144023
Flue Gas %02	6.6	7.2	7.1	7.0
Flue Gas %C02	13.0	12.6	12.7	12.8
Coal F-Factor (1)	9739	9702	9743	9728
Coal F-Factor (2)	1869	1869	1866	1868
MM Btu (1)	626.5	579.9	570.8	592.4
MM Btu (2)	620.3	578.7	573.2	590.7
MM Btu (avg)	623.4	579.3	572.0	591.6
Coal Btu	12158	12087	12100	12115
Coal Feed, lb/hr	51276	47927	47275	48826
Coal Feed, tph	25.64	23.96	23.64	24.41
% ash in coal	7.31	7.97	8.12	7.80
ppm Hg in coal	0.070	0.043	0.049	0.054
Ash production, lb/hr	3748	3820	3839	3802
Hg production, mg/min	27.13	15.58	17.51	20.07
Overhead Ash, lb/hr	2250	2290	2305	2282
Overhead Ash, %	60.0%	60.0%	60.0%	60.0%
ppm Hg in ash	0.967	0.928	0.893	0.929
Hg in ash, mg/min	16.45	16.06	15.56	16.02
Hg in ash, %	60.6%	103.1%	88.9%	84.2%
INLET:				
Hg conc in flue gas, lb/dscf	3.20E-10	2.33E-10	2.26E-10	2.60E-10
Hg in flue gas, lb/hr	2.85E-03	2.00E-03	1.90E-03	2.25E-03
Hg in flue gas, mg/min	21.57	15.12	14.39	17.02
Hg in flue gas, %	79.5%	97.0%	82.2%	86.2%
STACK:				
Hg in flue gas, lb/hr	6.54E-04	2.40E-04	2.85E-04	3.93E-04
Hg in flue gas, mg/min	4.94	1.81	2.15	2.97
Hg in flue gas, %	18.2%	11.6%	12.3%	14.1%
TOTAL Hg BALANCE:				
Total Hg Output, mg/min	21.39	17.88	17.71	18.99
Total Hg Balance, %	78.8%	114.8%	101.2%	98.3%

(1) - O2-based F-Factor
(2) - CO2-based F-Factor

Table A-8
Minnesota Power Clay Boswell Station
Unit 2 Mercury Material Balance Closures
(Using Measured BH Ash Rate)

	TEST 1	TEST 2	TEST 3	AVG
UNIT DATA:				
Flue Gas DSCFM	148633	143057	140378	144023
Flue Gas %02	6.6	7.2	7.1	7.0
Flue Gas %C02	13.0	12.6	12.7	12.8
Coal F-Factor (1)	9739	9702	9743	9728
Coal F-Factor (2)	1869	1869	1866	1868
MM Btu (1)	626.5	579.9	570.8	592.4
MM Btu (2)	620.3	578.7	573.2	590.7
MM Btu (avg)	623.4	579.3	572.0	591.6
Coal Btu	12158	12087	12100	12115
Coal Feed, lb/hr	51276	47927	47275	48826
Coal Feed, tph	25.64	23.96	23.64	24.41
% ash in coal	7.31	7.97	8.12	7.80
ppm Hg in coal	0.07	0.043	0.049	0.054
Ash production, lb/hr	3748	3820	3839	3802
Hg production, mg/min	27.13	15.58	17.51	20.07
Overhead Ash, lb/hr	1412	1802	1456	1557
Overhead Ash %	37.7%	47.2%	37.9%	40.9%
ppm Hg in ash	0.967	0.928	0.893	0.929
Hg is ash, mg/min	10.32	12.64	9.83	10.93
Hg in ash, %	38.0%	81.1%	56.1%	58.4%
INLET:				
Hg conc in flue gas, lb/dscf	3.20E-10	2.33E-10	2.26E-10	2.60E-10
Hg in flue gas, lb/hr	2.85E-03	2.00E-03	1.90E-03	2.25E-03
Hg in flue gas, mg/min	21.57	15.12	14.39	17.02
Hg in flue gas, %	79.5%	97.0%	82.2%	86.2%
STACK:				
Hg in flue gas, lb/hr	6.54E-04	2.40E-04	2.85E-04	3.93E-04
Hg in flue gas, mg/min	4.94	1.81	2.15	2.97
Hg in flue gas, %	18.2%	11.6%	12.3%	14.1%
TOTAL Hg BALANCE:				
Total Hg Output, mg/min	15.26	14.45	11.98	13.90
Total Hg Balance, %	56.3%	92.8%	68.4%	72.5%

(1) - O2-based F-Factor
(2) - CO2-based F-Factor

Table A-9
Minnesota Power Clay Boswell Station
Unit 3 Mercury Material Balance Closures
(Overhead Ash Rate Forced to 70%)

	TEST 1	TEST 2	TEST 3	AVG
UNIT DATA:				
Flue Gas DSCFM	957998	982042	975742	971927
Flue Gas %02	6.0	6.4	6.7	6.4
Flue Gas %C02	13.8	13.4	13.0	13.4
Coal F-Factor (1)	9746	9755	9726	9742
Coal F-Factor (2)	1875	1874	1876	1875
MM Btu (1)	4204.6	4190.6	4089.7	4161.7
MM Btu (2)	4230.5	4213.2	4056.9	4166.9
MM Btu (avg)	4217.6	4201.9	4073.3	4164.3
Coal Btu	12072	12052	11972	12032
Coal Feed, lb/hr	349369	348649	340238	346085
Coal Feed, tph	174.7	174.3	170.1	173.0
% ash in coal	7.67	8.13	8.54	8.11
ppm Hg in coal	0.063	0.063	0.063	0.063
Ash production, lb/hr	26797	28345	29056	28066
Hg production, mg/min	166.36	166.02	162.01	164.80
Overhead Ash, lb/hr	21460	23500	24400	23120
Overhead Ash %	80.1%	82.9%	84.0%	82.3%
ppm Hg in ash	0.075	0.042	0.035	0.051
Hg in ash, mg/min	12.33	7.46	6.64	8.75
Hg in ash, %	7.4%	4.5%	4.0%	5.3%
Slurry Water:				
L/min of water, from meter	4.03E+04	4.03E+04	4.03E+04	4.03E+04
Calculated % solids	0.40%	0.44%	0.46%	0.43%
Measured % solids	0.15%	0.24%	0.29%	0.23%
Hg Conc, ppb	1.1	0.85	0.79	0.9
Hg in water, mg/min	44.3	34.3	31.8	.36.8
Hg in water, %	26.7%	20.6%	19.7%	22.3%
INLET:				
Hg conc in flue gas, lb/dscf	3.29E-10	3.19E-10	2.92E-10	3.13E-10
Hg in flue gas, lb/hr	1.89E-02	1.88E-02	1.71E-02	1.83E-02
Hg in flue gas, mg/min	142.85	142.10	129.25	138.07
Hg in flue gas, %	85.9%	85.6%	79.8%	83.7%
STACK:				
Hg in flue gas, lb/hr	1.75E-02	1.62E-02	1.62E-02	1.66E-02
Hg in flue gas, mg/min	132.27	122.45	122.45	125.72
Hg in flue gas, %	79.5%	73.8%	75.6%	76.3%
TOTAL Hg BALANCE:				
Total Hg Output, mg/min	188.94	164.17	150.74	171.28
Total Hg Balance, %	113.6%	98.9%	99.2%	103.9%

(1) - O2-based F-Factor
(2) - CO2-based F-Factor

Table A-10
Minnesota Power Clay Boswell Station
Unit 3 Mercury Material Balance Closures
(Using Measured Ash Rate)

	TEST 1	TEST 2	TEST 3	AVG
UNIT DATA:				
Flue Gas DSCFM	957998	982042	975742	971927
Flue Gas %02	6.0	6.4	6.7	6.4
Flue Gas %C02	13.8	13.4	13.0	13.4
Coal F-Factor (1)	9746	9755	9726	9742
Coal F-Factor (2)	1875	1874	1876	1875
MM Btu (1)	4204.6	4190.6	4089.7	4161.7
MM Btu (2)	4230.5	4213.2	4056.9	4166.9
MM Btu (avg)	4217.6	4201.9	4073.3	4164.3
Coal Btu	12072	12052	11972	12032
Coal Feed, lb/hr	349369	348649	340238	346085
Coal Feed, tph	174.7	174.3	170.1	173.0
% ash in coal	7.67	8.13	8.54	8.11
ppm Hg in coal	0.063	0.063	0.063	0.063
Ash production, lb/hr	26797	28345	29056	28066
Hg production, mg/min	166.36	166.02	162.01	164.80
Overhead Ash, lb/hr	8673	10937	16892	12167
Overhead Ash %	32.4%	38.6%	58.1%	43.0%
ppm Hg in ash	0.076	0.042	0.035	0.051
Hg in ash, mg/min	4.98	3.47	4.47	4.33
Hg in ash, %	3.0%	2.1%	2.8%	2.6%
Slurry Water:				
L/min of water, from meter	4.03E+04	4.03E+04	4.03E+04	4.03E+04
Calculated % solids	0.16%	0.20%	0.32%	0.23%
Measured % solids	0.15%	0.24%	0.29%	0.23%
Hg Conc, ppb	1.1	0.9	0.8	0.9
Hg in water, mg/min	44.3	34.3	31.8	36.8
Hg in water, %	26.7%	20.6%	19.7%	22.3%
INLET:				
Hg conc in flue gas, lb/dscf	3.29E-10	3.19E-10	2.92E-10	3.13E-10
Hg in flue gas, lb/hr	1.89E-02	1.88E-02	1.71E-02	1.83E-02
Hg in flue gas, mg/min	142.85	142.10	129.25	138.07
Hg in flue gas, %	85.9%	85.6%	79.8%	83.7%
STACK:				
Hg in flue gas, lb/hr	1.75E-02	1.62E-02	1.62E-02	1.66E-02
Hg in flue gas, mg/min	132.27	122.45	122.45	125.72
Hg in flue gas, %	79.5%	73.8%	75.6%	76.3%
TOTAL Hg BALANCE:				
Total Hg Output, mg/min	181.59	160.18	158.76	166.84
Total Hg Balance, %	109.2%	96.5%	98.0%	101.2%

(1) - O2-based F-Factor
(2) - CO2-based F-Factor

Table A-11
Minnesota Power Clay Boswell Station
Unit 4 Mercury Material Balance Closures

Assumptions:
ESP particulate loading is forced to 10% of total flow and assumed 70% fly ash rate.
FGD solids mass flow calculated from mass of SO2 removed and sulfur content of solids.
FGD filtrate flow calculated from the measured percent and mass flow of solids.

	TEST 1	TEST 2	TEST 3	AVG
UNIT DATA:				
Flue Gas DSCFM	1289722	1284740	1266260	1280241
Flue Gas %02	5.2	5.6	6.0	5.6
Flue Gas %C02	14.4	14.2	13.8	14.1
Coal F-Factor (1)	9778	9716	9699	9731
Coal F-Factor (2)	1885	1868	1875	1876
MM Btu (1)	5945	5808	5585	5779
MM Btu (2)	5912	5860	5592	5788
MM Btu (avg)	5928	5834	5588	5783
Coal Btu	12075	12197	11888	12053
Coal Feed, lb/hr	490952	478302	470068	479774
Coal Feed, tph	245.5	239.2	235.0	239.9
% ash in coal	7.27	7.44	8.62	7.78
% sulfur in coal	0.54	0.57	0.60	0.57
ppm Hg in coal	0.065	0.063	0.070	0.066
Ash production, lb/hr	35692	35586	40520	37266
Hg production, mg/min	241.20	227.76	248.71	239.22
Mass Flow of FGD Slurry:				
SO2 production, lb/hr	5302	5453	5641	5465
SO2 in coal, lb/MM Btu	0.89	0.93	1.01	0.95
SO2 emissions, lb/MM Btu	0.10	0.10	0.10	0.10
SO2 removal, %	88.8%	89.3%	90.1%	89.4%
SO2 removed, lb/hr	4709	4869	5082	4887
% sulfur in FGD solids	8.56%	7.41%	7.73%	7.9%
FGD solids, lb/hr	55017	65712	65744	62158
FGD solids, lb/min	917	1095	1096	1036
Hg conc of FGD solids, ppm	0.021	0.027	0.031	0.026
Hg in FGD solids, mg/min	8.73	13.41	15.40	12.52
% Hg in FGD solids	3.6%	5.9%	6.2%	5.2%
Slurry Water:				
% Solids in Slurry	6.70%	6.90%	6.10%	6.57%
lb/hr slurry	8.21E+05	9.52E+05	1.08E+06	9.50E+05
lb/hr water	8.19E+05	9.50E+05	1.07E+06	9.48E+05
L/min of water	6.19E+03	7.18E+03	8.12E+03	7.16E+03
Hg Conc, ppb	2.70	2.90	2.40	2.70
Hg in water, mg/min	16.71	20.82	19.50	19.01
Hg in water, %	6.9%	9.1%	7.8%	8.0%

	TEST 1	TEST 2	TEST 3	AVG
ESP Particulate:				
ESP loading, lb/hr	2500	2500	2850	2617
Overhead Ash, %	7.0%	7.0%	7.0%	7.0%
ppm Hg in ash	0.010	0.016	0.012	0.013
Hg in ash, mg/min	0.19	0.30	0.26	0.25
Hg in ash, %	0.1%	0.1%	0.1%	0.1%
INLET:				
Hg conc in flue gas, lb/dscf	2.84E-10	2.92E-10	2.29E-10	2.68E-10
Hg in flue gas, lb/hr	2.20E-02	2.25E-02	1.74E-02	2.06E-02
Hg in flue gas, mg/min	166.28	170.06	131.52	155.95
Hg in flue gas, %	68.9%	74.7%	52.9%	65.5%
STACK:				
Hg in flue gas, lb/hr	2.40E-02	2.69E-02	2.54E-02	2.54E-02
Hg in flue gas, mg/min	181.40	203.32	191.98	192.23
Hg in flue gas, %	75.2%	89.3%	77.2%	80.6%
TOTAL Hg BALANCE:				
Total Hg Output, mg/min	207.03	237.85	227.14	224.01
Total Hg Balance, %	85.8%	104.4%	91.3%	93.9%

(1) - O2-based F-Factor
(2) - CO2-based F-Factor

APPENDIX B
PROCESS OPERATIONS, FACILITY CEMS AND AIR POLLUTION CONTROL DATA

minnesota power / p.o. box 128 / cohasset, minnesota 55721 / telephone 218-328-5711

boswell energy center

May 1, 2000

Jeff O'Neill
Roy F. Weston
1 Weston Way
West Chester, Pennsylvania
19380-1499

RE: Mercury Test Data

Dear Mr. O'Neill,

Enclosed is supporting data for the mercury testing on Boswell 2, 3 and 4 conducted from March 23 – March 28, 2000. I will be faxing you data on boiler gas temperature, steam flow and coal flows shortly.

If you have any questions please call me at (218) 328-5711.

Sincerely,

Joe Muller

Joe Muller
Environmental Compliance Specialist

Boswell 2 - March 23-24

	Coal - Tons / Hour
Run 1	32.26
Run 2	32.38
Run 3	32.38

Boswell 3 - March 21-22

	Coal - Tons / Hour
Run 1	187.13
Run 2	184.2
Run 3	184.6

Boswell 4 - March 27-28

	Coal - Tons / Hour
Run 1	294.62
Run 2	294.7
Run 3	294.7

Steam Flow
↓ klbs/Hr

	Boswell 2	Bos 2 Baghouse DP
Run 1	382	7.68
Run 2	381	7.60
Run 3	376	7.58

	Boswell 3	Press. Drop
Run 1	1987	
Run 2	1944	
Run 3	1993	

	Boswell 4
Run 1	3277
Run 2	3130
Run 3	3149

Boswell 3
Run 1

Enertec NTDAHS®
Average Values Report
04/10/00 09:12

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123, UNIT_3

Period Start: 03/21/00 09:03
Period End: 03/21/00 12:05
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit3Load mwt	Average Comb_Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_3 lb/MBT	Average StkFlwHrA kscfh
03/21/00 09:03	338.1	464.5	12.55	0.91	N/A	66450
03/21/00 09:04	334.8	462.1	12.53	0.92	N/A	66480
03/21/00 09:05	337.4	464.5	12.57	0.92	0.408	66480
03/21/00 09:06	336.6	463.7	12.53	0.91	0.413	66480
03/21/00 09:07	337.1	464.8	12.57	0.91	0.426	66456
03/21/00 09:08	339.8	467.1	12.54	0.91	0.413	66480
03/21/00 09:09	338.3	465.6	12.56	0.91	0.411	66480
03/21/00 09:10	337.9	464.8	N/A	N/A	0.417	66564
03/21/00 09:11	338.3	464.2	N/A	N/A	0.414	66690
03/21/00 09:12	338.5	464.4	N/A	N/A	0.421	66708
03/21/00 09:13	337.6	464.0	12.04	0.90	0.427	66678
03/21/00 09:14	337.2	463.4	12.20	0.90	0.431	66996
03/21/00 09:15	338.3	463.7	12.36	0.90	0.434	67020
03/21/00 09:16	337.6	462.0	12.39	0.90	0.436	67026
03/21/00 09:17	338.4	460.4	12.43	0.90	0.437	66822
03/21/00 09:18	338.7	459.3	12.51	0.90	0.439	66540
03/21/00 09:19	340.1	460.4	12.51	0.90	0.435	66540
03/21/00 09:20	340.2	459.9	12.50	0.89	N/A	66396
03/21/00 09:21	340.4	459.5	12.49	0.89	N/A	66144
03/21/00 09:22	338.1	457.0	12.51	0.89	0.441	66108
03/21/00 09:23	337.7	456.2	12.49	0.89	0.443	66138
03/21/00 09:24	337.7	455.9	12.50	0.89	0.432	65424
03/21/00 09:25	337.8	454.6	12.49	0.88	0.439	64938
03/21/00 09:26	337.9	453.2	12.43	0.88	0.450	64938
03/21/00 09:27	337.5	450.9	12.44	0.88	0.449	64662
03/21/00 09:28	337.9	449.4	12.48	0.87	0.444	64452
03/21/00 09:29	338.3	447.7	N/A	N/A	0.445	64452
03/21/00 09:30	338.2	445.7	N/A	N/A	0.443	64452
03/21/00 09:31	337.4	443.9	N/A	N/A	0.444	64326
03/21/00 09:32	337.2	442.6	12.09	0.88	0.444	64194
03/21/00 09:33	337.7	442.5	12.22	0.88	0.449	64194
03/21/00 09:34	337.6	444.0	12.33	0.88	0.448	63936
03/21/00 09:35	341.7	446.7	12.40	0.88	0.442	63786
03/21/00 09:36	337.9	443.0	12.43	0.87	0.441	63762
03/21/00 09:37	339.7	444.0	12.44	0.87	0.440	63762
03/21/00 09:38	340.5	444.7	12.47	0.86	N/A	63708
03/21/00 09:39	339.1	443.7	12.45	0.86	N/A	63708
03/21/00 09:40	339.4	444.2	12.49	0.86	0.426	63708
03/21/00 09:41	338.6	443.4	12.45	0.86	0.425	63708
03/21/00 09:42	338.5	443.3	12.47	0.86	0.437	63708
03/21/00 09:43	337.9	442.4	12.46	0.86	0.430	63678
03/21/00 09:44	336.1	440.8	12.50	0.85	0.433	63678
03/21/00 09:45	338.1	442.2	12.50	0.85	0.436	63654
03/21/00 09:46	338.0	442.2	12.46	0.85	0.443	63678
03/21/00 09:47	340.6	444.4	12.53	0.85	0.440	63654
03/21/00 09:48	339.7	443.3	N/A	N/A	0.446	63450
03/21/00 09:49	341.4	444.7	N/A	N/A	0.454	63450
03/21/00 09:50	341.2	444.6	N/A	N/A	0.449	63450

03/21/00	09:51	341.0	444.1	12.12	0.86	0.441	63420
03/21/00	09:52	338.7	441.8	12.30	0.85	0.446	63336
03/21/00	09:53	338.4	441.6	12.33	0.85	0.444	63336
03/21/00	09:54	337.5	440.8	12.44	0.85	0.452	63336
03/21/00	09:55	337.8	440.7	12.48	0.84	0.456	62910
03/21/00	09:56	337.0	440.2	12.46	0.84	N/A	62790
03/21/00	09:57	338.0	441.2	12.47	0.84	0.435	62790
03/21/00	09:58	337.3	440.2	12.49	0.83	0.446	62880
03/21/00	09:59	337.9	440.8	12.43	0.83	0.442	63000
03/21/00	10:00	339.2	442.0	12.48	0.83	0.440	62994
03/21/00	10:01	340.4	443.4	12.50	0.83	0.444	62850
03/21/00	10:02	340.9	444.2	12.48	0.83	0.451	62736
03/21/00	10:03	342.8	445.8	12.47	0.83	0.449	62706
03/21/00	10:04	342.2	445.4	12.47	0.83	0.448	62706
03/21/00	10:05	342.0	445.2	12.50	0.83	0.442	62706
03/21/00	10:06	342.7	445.7	N/A	N/A	0.441	62736
03/21/00	10:07	340.5	443.6	N/A	N/A	0.447	62736
03/21/00	10:08	339.1	441.9	N/A	N/A	0.439	62736
03/21/00	10:09	338.5	441.4	11.99	0.82	0.442	62736
03/21/00	10:10	337.5	440.6	12.18	0.82	0.444	62736
03/21/00	10:11	338.0	440.5	12.36	0.82	0.438	63108
03/21/00	10:12	337.6	440.0	12.42	0.83	0.445	63234
03/21/00	10:13	337.1	439.7	12.43	0.83	N/A	63252
03/21/00	10:14	338.4	440.8	12.44	0.84	N/A	63126
03/21/00	10:15	338.7	441.0	12.44	0.84	0.437	63054
03/21/00	10:16	339.5	441.8	12.45	0.83	0.435	63048
03/21/00	10:17	340.3	442.9	12.48	0.83	0.448	63138
03/21/00	10:18	339.8	442.4	12.46	0.82	0.435	63510
03/21/00	10:19	339.2	441.8	12.43	0.82	0.421	63564
03/21/00	10:20	339.1	441.9	12.45	0.82	0.426	63564
03/21/00	10:21	340.4	443.1	12.45	0.82	0.426	63906
03/21/00	10:22	341.0	443.6	12.45	0.82	0.430	63930
03/21/00	10:23	341.5	444.3	12.45	0.82	0.430	63936
03/21/00	10:24	341.8	444.5	12.48	0.82	0.431	63960
03/21/00	10:25	341.0	443.7	N/A	N/A	0.460	63990
03/21/00	10:26	339.1	441.8	N/A	N/A	0.478	64014
03/21/00	10:27	336.3	439.2	N/A	N/A	0.468	64020
03/21/00	10:28	334.7	437.5	11.68	0.83	0.457	64398
03/21/00	10:29	333.3	436.3	11.93	0.83	0.449	64452
03/21/00	10:30	334.2	437.1	12.05	0.83	0.452	64452
03/21/00	10:31	336.6	439.5	12.17	0.83	N/A	64692
03/21/00	10:32	338.8	441.5	12.17	0.83	N/A	64914
03/21/00	10:33	340.2	443.3	12.24	0.83	0.431	64938
03/21/00	10:34	340.7	443.6	12.24	0.83	0.433	65184
03/21/00	10:35	339.4	442.2	12.25	0.83	0.432	65568
03/21/00	10:36	336.3	439.1	12.28	0.82	0.423	65592
03/21/00	10:37	336.6	439.3	12.25	0.82	0.424	65592
03/21/00	10:38	335.5	438.2	12.29	0.83	0.428	65544
03/21/00	10:39	335.1	438.1	12.28	0.83	0.432	65508
03/21/00	10:40	335.0	438.1	12.28	0.82	0.427	65508
03/21/00	10:41	336.3	439.3	12.29	0.83	0.428	65484
03/21/00	10:42	338.4	441.0	12.27	0.83	0.424	65406
03/21/00	10:43	339.4	442.3	12.35	0.83	0.418	65394
03/21/00	10:44	340.7	443.4	N/A	N/A	0.424	65292
03/21/00	10:45	340.3	442.9	N/A	N/A	0.425	64938
03/21/00	10:46	340.1	442.8	N/A	N/A	0.429	64962
03/21/00	10:47	339.7	442.3	11.96	0.85	0.422	64968
03/21/00	10:48	338.5	441.1	12.12	0.84	0.425	65118
03/21/00	10:49	339.3	441.8	12.16	0.84	N/A	65310
03/21/00	10:50	339.6	442.3	12.15	0.84	N/A	65286
03/21/00	10:51	341.0	443.3	12.22	0.84	0.442	65682
03/21/00	10:52	341.6	444.4	12.18	0.84	0.456	65832
03/21/00	10:53	342.6	445.4	12.13	0.84	0.449	65826
03/21/00	10:54	341.6	444.2	12.13	0.84	0.424	65820

03/21/00 10:55	340.4	443.3	12.17	0.84	0.434	66282
03/21/00 10:56	339.0	441.6	12.20	0.84	0.439	66354
03/21/00 10:57	338.7	441.1	12.24	0.84	0.428	66366
03/21/00 10:58	338.0	440.2	12.17	0.84	0.441	66012
03/21/00 10:59	337.4	440.2	12.23	0.84	0.448	65682
03/21/00 11:00	340.0	442.4	12.23	0.84	0.439	65682
03/21/00 11:01	340.4	443.1	12.22	0.84	0.432	65622
03/21/00 11:02	340.6	443.4	12.25	0.84	0.441	65454
03/21/00 11:03	339.0	441.8	N/A	N/A	0.432	65454
03/21/00 11:04	337.9	440.6	N/A	N/A	0.418	65454
03/21/00 11:05	337.6	440.4	N/A	N/A	0.422	65454
03/21/00 11:06	336.4	439.2	12.16	0.86	0.423	65454
03/21/00 11:07	335.1	437.8	12.27	0.86	N/A	65454
03/21/00 11:08	335.8	438.3	12.35	0.85	0.441	65454
03/21/00 11:09	335.1	438.0	12.39	0.84	0.437	65454
03/21/00 11:10	336.7	439.4	12.41	0.84	0.432	65454
03/21/00 11:11	337.4	440.3	12.38	0.85	0.432	65166
03/21/00 11:12	338.1	440.9	12.40	0.85	0.440	65022
03/21/00 11:13	337.5	440.7	12.41	0.84	0.435	64998
03/21/00 11:14	337.4	440.4	12.42	0.84	0.433	65016
03/21/00 11:15	336.4	439.2	12.42	0.84	0.434	64998
03/21/00 11:16	334.8	437.8	12.41	0.84	0.428	64992
03/21/00 11:17	335.6	438.3	12.40	0.84	0.431	65016
03/21/00 11:18	334.3	437.4	12.41	0.84	0.433	64650
03/21/00 11:19	335.6	438.4	12.42	0.84	0.435	64032
03/21/00 11:20	335.3	438.4	12.42	0.84	0.439	63936
03/21/00 11:21	335.6	438.3	N/A	N/A	0.442	63972
03/21/00 11:22	335.9	438.4	N/A	N/A	0.439	64050
03/21/00 11:23	335.8	438.8	N/A	N/A	0.433	64080
03/21/00 11:24	335.2	437.7	11.86	0.87	N/A	64080
03/21/00 11:25	335.1	437.8	12.11	0.87	N/A	64128
03/21/00 11:26	335.3	438.4	12.27	0.87	0.428	64224
03/21/00 11:27	334.5	437.7	12.37	0.86	0.443	64224
03/21/00 11:28	337.4	440.5	12.36	0.86	0.442	64308
03/21/00 11:29	338.9	441.9	12.34	0.86	0.440	64764
03/21/00 11:30	337.4	440.5	12.39	0.86	0.443	64764
03/21/00 11:31	338.0	440.9	12.41	0.85	0.449	64764
03/21/00 11:32	337.2	440.0	12.40	0.85	0.435	64590
03/21/00 11:33	338.2	440.6	12.40	0.86	0.430	64536
03/21/00 11:34	336.1	438.9	12.42	0.86	0.424	64578
03/21/00 11:35	337.9	440.9	12.43	0.86	0.423	64848
03/21/00 11:36	338.4	440.9	12.43	0.86	0.431	65052
03/21/00 11:37	340.2	442.8	12.39	0.86	0.432	65106
03/21/00 11:38	340.0	442.8	12.45	0.86	0.442	65076
03/21/00 11:39	339.5	441.9	12.45	0.87	0.450	65022
03/21/00 11:40	341.9	444.6	N/A	N/A	0.443	65022
03/21/00 11:41	341.9	444.2	N/A	N/A	0.439	65022
03/21/00 11:42	339.9	442.5	N/A	N/A	N/A	65124
03/21/00 11:43	340.7	443.3	12.20	0.87	N/A	65454
03/21/00 11:44	339.4	442.4	12.34	0.87	0.437	65454
03/21/00 11:45	338.4	441.4	12.42	0.87	0.440	65454
03/21/00 11:46	340.0	442.7	12.44	0.87	0.438	65514
03/21/00 11:47	339.9	442.8	12.44	0.87	0.433	65538
03/21/00 11:48	338.2	441.5	12.47	0.87	0.443	65538
03/21/00 11:49	340.5	443.5	12.50	0.87	0.443	65538
03/21/00 11:50	339.8	443.0	12.47	0.87	0.442	66234
03/21/00 11:51	339.2	442.0	12.48	0.86	0.445	66336
03/21/00 11:52	336.9	439.4	12.47	0.86	0.448	66222
03/21/00 11:53	336.1	438.9	12.43	0.86	0.445	65964
03/21/00 11:54	336.4	439.4	12.42	0.86	0.438	65964
03/21/00 11:55	338.4	441.1	12.44	0.86	0.434	65946
03/21/00 11:56	339.1	441.8	12.47	0.86	0.437	65364
03/21/00 11:57	339.4	442.1	12.47	0.86	0.441	65280
03/21/00 11:58	340.0	443.0	12.51	0.86	0.450	65310

03/21/00 11:59	340.0	443.9	N/A	N/A	0.451	65310
03/21/00 12:00	340.7	445.7	N/A	N/A	N/A	64164
03/21/00 12:01	338.5	444.3	N/A	N/A	0.444	64164
03/21/00 12:02	335.5	441.9	12.03	0.86	0.452	64134
03/21/00 12:03	337.0	443.3	12.22	0.85	0.449	64278
03/21/00 12:04	336.0	442.9	12.25	0.85	0.443	64506
Final Average*	**338.4**	**444.4**	**12.36**	**0.85**	**0.437**	**64749**
Maximum*	**342.8**	**467.1**	**12.57**	**0.92**	**0.478**	**67026**
Minimum*	**333.3**	**436.3**	**11.68**	**0.82**	**0.408**	**62706**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 3
Run 2

Enertec NTDAHS®
Average Values Report
04/10/00 09:13

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123, UNIT_3

Period Start: 03/21/00 15:15
Period End: 03/21/00 17:59
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit3Load mwt	Average Comb_Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_3 lb/MBT	Average StkFlwHrA kscfh
03/21/00 15:15	334.4	440.3	12.02	0.83	N/A	66138
03/21/00 15:16	334.8	440.8	12.04	0.82	0.449	66138
03/21/00 15:17	334.7	440.6	11.97	0.82	0.441	66084
03/21/00 15:18	332.2	438.5	12.01	0.82	0.436	66078
03/21/00 15:19	331.7	437.9	12.03	0.82	0.431	66078
03/21/00 15:20	330.7	437.1	12.04	0.83	0.435	66450
03/21/00 15:21	331.3	437.4	12.03	0.83	0.431	66474
03/21/00 15:22	332.5	438.4	11.97	0.82	0.434	66480
03/21/00 15:23	331.7	437.8	12.01	0.82	0.444	66480
03/21/00 15:24	333.8	439.8	11.99	0.82	0.440	66450
03/21/00 15:25	333.1	439.4	N/A	N/A	0.439	66474
03/21/00 15:26	334.3	440.4	N/A	N/A	0.434	66480
03/21/00 15:27	334.6	440.5	N/A	N/A	0.439	66606
03/21/00 15:28	335.9	441.2	11.71	0.84	0.446	66678
03/21/00 15:29	334.6	440.4	11.92	0.84	0.439	66678
03/21/00 15:30	334.8	440.5	12.02	0.83	0.437	66678
03/21/00 15:31	334.4	440.5	12.05	0.83	0.436	66678
03/21/00 15:32	333.3	438.9	12.11	0.83	N/A	66678
03/21/00 15:33	332.8	438.1	12.06	0.83	N/A	66558
03/21/00 15:34	331.7	437.0	12.08	0.83	0.450	66168
03/21/00 15:35	330.4	435.8	12.07	0.82	0.452	66168
03/21/00 15:36	331.2	436.6	12.03	0.82	0.436	66114
03/21/00 15:37	332.4	437.9	12.05	0.81	0.427	65682
03/21/00 15:38	331.0	436.5	12.07	0.82	0.428	65622
03/21/00 15:39	330.4	435.7	12.06	0.81	0.433	65622
03/21/00 15:40	333.7	438.6	12.02	0.81	0.424	65550
03/21/00 15:41	332.3	437.4	12.05	0.81	0.438	65436
03/21/00 15:42	333.6	439.0	12.03	0.81	0.438	65424
03/21/00 15:43	332.1	437.7	12.10	0.81	0.431	65532
03/21/00 15:44	332.8	438.3	N/A	N/A	0.429	65682
03/21/00 15:45	332.4	437.6	N/A	N/A	0.432	65682
03/21/00 15:46	330.8	436.2	N/A	N/A	0.413	65682
03/21/00 15:47	333.1	438.2	11.67	0.82	0.430	65922
03/21/00 15:48	332.2	437.1	11.82	0.83	0.423	66192
03/21/00 15:49	331.9	437.2	11.92	0.83	0.421	66192
03/21/00 15:50	335.1	439.9	12.01	0.82	N/A	66366
03/21/00 15:51	334.8	439.5	12.03	0.82	0.429	66654
03/21/00 15:52	333.5	438.9	12.03	0.82	0.427	66654
03/21/00 15:53	332.5	438.1	12.03	0.81	0.427	66654
03/21/00 15:54	330.5	435.8	12.03	0.81	0.427	66912
03/21/00 15:55	332.0	436.6	12.04	0.81	0.425	67110
03/21/00 15:56	331.4	436.3	12.04	0.81	0.422	67110
03/21/00 15:57	331.7	436.4	12.03	0.82	0.425	67014
03/21/00 15:58	335.3	439.9	12.04	0.82	0.429	66912
03/21/00 15:59	335.2	440.2	12.01	0.82	0.427	66912
03/21/00 16:00	338.7	443.6	12.03	0.82	0.423	66912
03/21/00 16:01	338.5	443.7	12.00	0.82	0.422	66876
03/21/00 16:02	337.0	441.9	N/A	N/A	0.426	66852

03/21/00 16:03	336.7	441.5	N/A	N/A	0.428	66852
03/21/00 16:04	334.5	439.8	N/A	N/A	0.424	66882
03/21/00 16:05	333.4	438.9	11.58	0.84	0.425	66882
03/21/00 16:06	332.7	437.9	11.78	0.84	0.430	66882
03/21/00 16:07	336.0	440.9	11.98	0.83	N/A	66882
03/21/00 16:08	337.6	442.2	12.06	0.83	N/A	66882
03/21/00 16:09	338.3	443.3	12.11	0.83	0.436	66882
03/21/00 16:10	337.6	443.7	12.11	0.83	0.441	66882
03/21/00 16:11	334.6	440.9	12.06	0.82	0.440	66582
03/21/00 16:12	332.6	439.1	12.08	0.82	0.430	66510
03/21/00 16:13	331.0	437.5	12.06	0.82	0.436	66510
03/21/00 16:14	331.5	438.3	12.06	0.82	0.434	66480
03/21/00 16:15	333.8	440.0	12.06	0.82	0.424	66282
03/21/00 16:16	333.6	439.7	12.02	0.82	0.420	66282
03/21/00 16:17	335.5	441.7	12.02	0.82	0.415	66258
03/21/00 16:18	333.6	439.7	12.07	0.82	0.418	66108
03/21/00 16:19	334.7	440.4	12.06	0.82	0.426	65994
03/21/00 16:20	332.4	438.7	12.04	0.82	0.424	65988
03/21/00 16:21	334.4	440.6	N/A	N/A	0.418	65940
03/21/00 16:22	334.8	440.4	N/A	N/A	0.418	65766
03/21/00 16:23	332.7	438.8	N/A	N/A	0.421	65790
03/21/00 16:24	335.8	441.9	11.59	0.84	0.421	65766
03/21/00 16:25	336.9	442.9	11.80	0.84	N/A	66096
03/21/00 16:26	338.4	443.8	11.95	0.83	N/A	66222
03/21/00 16:27	336.2	442.3	11.98	0.83	0.431	66300
03/21/00 16:28	335.2	442.3	12.03	0.82	0.433	66654
03/21/00 16:29	333.2	440.9	12.00	0.82	0.433	66852
03/21/00 16:30	331.4	438.8	12.00	0.82	0.427	66852
03/21/00 16:31	331.1	439.1	12.05	0.82	0.432	66918
03/21/00 16:32	331.5	439.3	12.04	0.82	0.433	67416
03/21/00 16:33	331.3	438.7	12.02	0.82	0.436	67710
03/21/00 16:34	332.4	439.1	12.03	0.82	0.432	67710
03/21/00 16:35	334.0	440.7	12.01	0.82	0.435	68052
03/21/00 16:36	334.2	440.9	12.01	0.82	0.433	68256
03/21/00 16:37	333.7	441.1	11.99	0.81	0.430	68256
03/21/00 16:38	331.8	440.3	12.05	0.81	0.435	68256
03/21/00 16:39	330.0	440.6	12.00	0.82	0.416	67644
03/21/00 16:40	330.5	442.6	N/A	N/A	0.428	67626
03/21/00 16:41	331.1	443.6	N/A	N/A	0.431	67614
03/21/00 16:42	331.9	444.4	N/A	N/A	0.432	67536
03/21/00 16:43	332.5	445.2	11.61	0.83	N/A	67308
03/21/00 16:44	331.8	444.8	11.88	0.84	0.430	67284
03/21/00 16:45	332.3	445.2	11.95	0.83	0.434	67290
03/21/00 16:46	332.2	444.5	12.00	0.83	0.433	67338
03/21/00 16:47	332.9	445.2	11.98	0.83	0.432	67368
03/21/00 16:48	333.6	445.5	12.00	0.83	0.431	67368
03/21/00 16:49	334.0	445.7	12.02	0.83	0.434	67950
03/21/00 16:50	333.8	445.4	12.06	0.82	0.453	68052
03/21/00 16:51	335.0	446.5	12.06	0.82	0.423	68052
03/21/00 16:52	333.2	445.1	12.03	0.82	0.425	68052
03/21/00 16:53	333.0	444.9	12.01	0.82	0.436	67794
03/21/00 16:54	330.7	442.7	12.07	0.82	0.433	67794
03/21/00 16:55	330.4	442.5	12.02	0.82	0.432	67794
03/21/00 16:56	329.8	441.9	12.02	0.82	0.427	67254
03/21/00 16:57	330.7	442.7	12.02	0.82	0.424	67224
03/21/00 16:58	331.4	443.1	12.04	0.82	0.425	67224
03/21/00 16:59	332.2	444.0	N/A	N/A	0.424	67422
03/21/00 17:00	334.5	446.0	N/A	N/A	N/A	67512
03/21/00 17:01	334.3	446.3	N/A	N/A	N/A	67482
03/21/00 17:02	333.1	445.0	11.87	0.84	0.419	67482
03/21/00 17:03	330.7	442.0	12.04	0.83	0.438	67338
03/21/00 17:04	330.8	441.1	12.05	0.83	0.450	67338
03/21/00 17:05	330.5	439.5	12.08	0.82	0.464	67368
03/21/00 17:06	331.8	440.3	12.07	0.82	0.446	67368

03/21/00 17:07	331.9	440.3	12.04	0.82	0.437	67368
03/21/00 17:08	333.3	441.0	12.06	0.82	0.429	67368
03/21/00 17:09	335.1	441.4	11.98	0.82	0.431	67368
03/21/00 17:10	334.5	440.1	12.03	0.82	0.427	67368
03/21/00 17:11	333.9	439.0	12.04	0.82	0.421	67194
03/21/00 17:12	330.4	435.4	12.00	0.82	0.429	67080
03/21/00 17:13	331.0	435.5	12.03	0.82	0.425	67080
03/21/00 17:14	331.3	435.9	12.05	0.82	0.427	66432
03/21/00 17:15	329.9	434.6	11.98	0.82	0.433	65766
03/21/00 17:16	329.9	434.9	11.96	0.82	0.436	65796
03/21/00 17:17	330.9	435.9	N/A	0.82	0.431	65796
03/21/00 17:18	334.0	438.7	N/A	N/A	N/A	65508
03/21/00 17:19	331.8	437.0	N/A	N/A	N/A	65334
03/21/00 17:20	330.2	435.5	11.34	0.83	0.427	65334
03/21/00 17:21	328.8	433.6	11.59	0.84	0.432	65082
03/21/00 17:22	328.3	433.1	11.71	0.84	0.427	64758
03/21/00 17:23	329.8	434.1	11.77	0.84	0.427	64710
03/21/00 17:24	330.3	435.1	11.86	0.84	0.442	64764
03/21/00 17:25	332.5	437.2	11.88	0.84	0.431	64992
03/21/00 17:26	334.4	438.7	11.90	0.83	0.429	64992
03/21/00 17:27	335.0	439.2	11.93	0.83	0.424	64992
03/21/00 17:28	334.6	439.2	11.91	0.83	0.423	65346
03/21/00 17:29	333.8	438.7	11.92	0.83	0.427	65706
03/21/00 17:30	332.8	437.6	11.94	0.83	0.419	65808
03/21/00 17:31	330.2	435.1	11.91	0.83	0.431	66540
03/21/00 17:32	330.8	435.8	11.97	0.83	0.431	66798
03/21/00 17:33	332.5	437.3	11.97	0.83	0.440	66798
03/21/00 17:34	334.7	439.0	11.99	0.83	0.427	66798
03/21/00 17:35	337.1	441.5	11.98	0.83	0.408	67140
03/21/00 17:36	336.3	441.1	N/A	N/A	N/A	67374
03/21/00 17:37	335.3	440.0	N/A	N/A	N/A	67398
03/21/00 17:38	333.2	437.7	N/A	N/A	0.417	67194
03/21/00 17:39	330.9	435.3	11.47	0.85	0.420	66882
03/21/00 17:40	330.7	435.2	11.65	0.85	0.419	66882
03/21/00 17:41	330.9	436.1	11.81	0.84	0.425	66882
03/21/00 17:42	331.7	436.6	11.89	0.84	0.430	66798
03/21/00 17:43	333.0	437.7	11.89	0.84	0.427	66738
03/21/00 17:44	333.8	439.0	11.96	0.84	0.424	66738
03/21/00 17:45	334.8	439.7	12.00	0.84	0.427	66738
03/21/00 17:46	335.4	440.1	11.99	0.84	0.431	66798
03/21/00 17:47	333.3	438.5	11.97	0.84	0.431	66798
03/21/00 17:48	333.0	437.9	11.97	0.84	0.427	66798
03/21/00 17:49	330.4	436.2	11.94	0.84	0.423	67512
03/21/00 17:50	332.3	438.1	11.94	0.84	0.409	67566
03/21/00 17:51	332.5	438.3	11.98	0.85	0.410	67536
03/21/00 17:52	333.1	438.9	11.97	0.85	0.423	67512
03/21/00 17:53	335.8	441.3	11.97	0.85	N/A	67482
03/21/00 17:54	336.1	441.5	11.99	0.85	N/A	67482
03/21/00 17:55	337.6	442.8	N/A	N/A	0.401	67254
03/21/00 17:56	336.0	441.5	N/A	N/A	0.404	66396
03/21/00 17:57	336.5	441.7	N/A	N/A	0.415	66396
03/21/00 17:58	333.5	438.9	11.62	0.87	0.423	66396
Final Average*	**333.1**	**439.7**	**11.97**	**0.83**	**0.429**	**66678**
Maximum*	**338.7**	**446.5**	**12.11**	**0.87**	**0.464**	**68256**
Minimum*	**328.3**	**433.1**	**11.34**	**0.81**	**0.401**	**64710**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 3
Run 3

Enertec NTDAHS®
Average Values Report
04/10/00 09:14

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123, UNIT_3

Period Start: 03/22/00 08:35
Period End: 03/22/00 11:12
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit3Load mwt	Average Comb_Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_3 lb/MBT	Average StkFlwHrA kscfh
03/22/00 08:35	330.7	433.9	11.60	1.01	0.298	64710
03/22/00 08:36	330.9	433.9	11.75	1.00	0.302	64710
03/22/00 08:37	331.7	434.8	11.91	1.00	0.292	64338
03/22/00 08:38	332.6	435.8	11.97	1.01	0.295	63624
03/22/00 08:39	334.3	437.6	12.05	1.01	0.303	63624
03/22/00 08:40	334.5	438.1	12.03	1.01	0.306	63648
03/22/00 08:41	334.5	438.1	12.10	1.01	0.303	63876
03/22/00 08:42	334.8	438.1	12.06	1.00	0.298	63936
03/22/00 08:43	333.0	436.3	12.07	1.00	0.300	63936
03/22/00 08:44	330.5	433.7	12.07	1.00	0.302	63762
03/22/00 08:45	331.0	434.1	12.05	1.00	N/A	63690
03/22/00 08:46	330.0	433.5	12.06	1.00	N/A	63678
03/22/00 08:47	330.5	434.0	12.10	1.00	0.294	64302
03/22/00 08:48	333.0	436.3	12.08	1.00	0.293	65106
03/22/00 08:49	332.8	436.1	12.07	1.00	0.295	65130
03/22/00 08:50	332.6	436.1	12.05	1.00	0.294	65136
03/22/00 08:51	333.0	436.1	N/A	N/A	0.295	64734
03/22/00 08:52	333.1	436.3	N/A	N/A	0.297	64650
03/22/00 08:53	332.1	435.4	N/A	N/A	0.302	64620
03/22/00 08:54	330.7	434.2	11.52	1.00	0.305	65136
03/22/00 08:55	332.0	435.0	11.74	1.00	0.301	65286
03/22/00 08:56	331.2	434.1	11.88	1.00	0.301	65310
03/22/00 08:57	333.0	435.8	11.93	1.00	0.290	65310
03/22/00 08:58	332.5	435.7	12.02	1.00	0.291	64734
03/22/00 08:59	335.4	438.4	12.03	1.00	0.292	64566
03/22/00 09:00	335.6	438.4	12.06	1.01	0.290	64566
03/22/00 09:01	335.8	438.7	12.06	1.01	0.291	64650
03/22/00 09:02	335.3	438.6	12.04	1.00	0.291	64710
03/22/00 09:03	333.1	436.4	12.03	1.00	N/A	64686
03/22/00 09:04	332.0	435.2	12.06	1.00	0.311	64710
03/22/00 09:05	330.9	434.2	12.10	1.00	0.297	64710
03/22/00 09:06	331.1	434.2	12.08	1.00	0.293	64680
03/22/00 09:07	331.7	434.8	12.07	1.00	0.292	64680
03/22/00 09:08	331.5	434.8	12.07	0.99	0.293	64680
03/22/00 09:09	331.7	435.1	12.04	0.99	0.291	64680
03/22/00 09:10	330.0	433.3	N/A	N/A	0.295	64650
03/22/00 09:11	331.4	434.6	N/A	N/A	0.294	64506
03/22/00 09:12	332.4	435.6	N/A	N/A	0.289	64506
03/22/00 09:13	335.4	438.5	11.71	1.00	0.290	64506
03/22/00 09:14	338.5	441.4	11.95	1.01	0.307	64362
03/22/00 09:15	337.6	440.8	12.06	1.02	0.312	64362
03/22/00 09:16	337.7	441.1	12.07	1.01	0.314	64362
03/22/00 09:17	337.0	440.7	12.12	1.01	0.313	64488
03/22/00 09:18	334.8	438.8	12.07	1.04	0.319	64710
03/22/00 09:19	333.8	437.7	12.10	1.05	0.321	64710
03/22/00 09:20	334.3	437.9	12.06	1.04	N/A	64680
03/22/00 09:21	336.2	439.8	12.07	1.03	N/A	64650
03/22/00 09:22	336.0	439.3	12.08	1.03	0.298	64620

03/22/00 09:23	335.4	438.8	12.06	1.04	0.312	64644
03/22/00 09:24	336.8	440.5	12.08	1.04	0.319	64710
03/22/00 09:25	336.3	440.4	12.08	1.04	0.318	64830
03/22/00 09:26	336.4	439.7	12.07	1.03	0.316	64848
03/22/00 09:27	337.3	440.5	12.05	1.03	0.311	64710
03/22/00 09:28	337.1	440.4	12.10	1.03	0.311	64194
03/22/00 09:29	335.9	439.1	N/A	N/A	0.316	64194
03/22/00 09:30	336.0	439.1	N/A	N/A	0.316	64194
03/22/00 09:31	335.4	438.6	N/A	N/A	0.319	63852
03/22/00 09:32	334.8	438.0	11.65	1.02	0.323	63648
03/22/00 09:33	333.6	436.8	11.82	1.01	0.322	63648
03/22/00 09:34	334.1	437.0	11.96	1.01	0.319	63678
03/22/00 09:35	333.3	436.1	11.97	1.01	0.323	64032
03/22/00 09:36	331.2	433.9	12.01	1.00	0.326	64080
03/22/00 09:37	330.2	432.8	12.00	1.00	0.327	64080
03/22/00 09:38	330.9	433.5	11.99	1.00	N/A	64248
03/22/00 09:39	331.8	434.6	12.03	1.00	N/A	64248
03/22/00 09:40	333.7	436.7	12.06	1.00	0.321	64248
03/22/00 09:41	334.1	437.1	12.08	0.99	0.324	64968
03/22/00 09:42	333.3	436.6	12.03	0.99	0.328	65166
03/22/00 09:43	334.1	437.1	12.03	0.99	0.326	65166
03/22/00 09:44	333.0	436.2	12.04	1.00	0.327	65166
03/22/00 09:45	333.4	436.8	12.07	1.00	0.330	65106
03/22/00 09:46	333.4	436.8	12.07	1.00	0.331	65106
03/22/00 09:47	333.2	436.6	12.10	1.00	0.329	65106
03/22/00 09:48	333.6	436.6	N/A	N/A	0.330	65652
03/22/00 09:49	335.1	438.4	N/A	N/A	0.327	65724
03/22/00 09:50	334.6	437.9	11.71	1.01	0.331	65736
03/22/00 09:51	335.1	438.3	11.88	1.01	0.334	65334
03/22/00 09:52	333.5	436.7	12.04	1.01	0.334	64848
03/22/00 09:53	333.7	436.6	12.06	1.00	0.330	64848
03/22/00 09:54	333.0	435.8	12.03	1.00	0.337	64878
03/22/00 09:55	332.5	435.3	12.06	1.00	0.341	65052
03/22/00 09:56	332.8	435.6	12.08	1.00	N/A	65022
03/22/00 09:57	332.7	436.5	12.08	1.00	0.331	65022
03/22/00 09:58	331.9	436.7	12.12	0.99	0.342	64878
03/22/00 09:59	333.1	439.2	12.06	0.99	0.342	64824
03/22/00 10:00	333.3	440.3	12.11	0.99	0.339	64794
03/22/00 10:01	333.7	442.3	12.07	1.00	0.340	64818
03/22/00 10:02	333.2	443.4	12.08	1.00	0.333	66054
03/22/00 10:03	333.3	444.5	12.10	1.01	0.330	66054
03/22/00 10:04	333.8	447.1	12.12	1.01	0.336	66054
03/22/00 10:05	332.4	447.6	12.13	1.01	0.339	66054
03/22/00 10:06	333.8	450.2	N/A	N/A	0.338	66054
03/22/00 10:07	333.2	449.8	N/A	N/A	0.333	66030
03/22/00 10:08	335.8	452.1	N/A	N/A	0.326	66024
03/22/00 10:09	335.1	452.4	11.70	1.01	0.326	66192
03/22/00 10:10	334.4	451.3	11.96	1.02	0.330	67026
03/22/00 10:11	332.8	448.9	12.06	1.01	0.334	67026
03/22/00 10:12	332.5	446.5	12.09	1.00	0.336	67026
03/22/00 10:13	331.5	443.5	12.06	1.00	N/A	67626
03/22/00 10:14	332.9	443.0	12.07	1.00	N/A	67824
03/22/00 10:15	333.1	441.8	12.11	1.00	0.331	67824
03/22/00 10:16	332.2	439.4	12.09	1.00	0.331	67536
03/22/00 10:17	330.9	437.8	12.10	0.99	0.331	67482
03/22/00 10:18	330.1	436.6	12.11	0.99	0.337	67482
03/22/00 10:19	331.2	437.6	12.09	0.99	0.329	67482
03/22/00 10:20	333.0	441.2	12.08	0.98	0.327	66804
03/22/00 10:21	335.0	445.0	12.12	0.98	0.328	66594
03/22/00 10:22	335.1	446.5	12.09	0.98	0.330	66594
03/22/00 10:23	335.6	446.9	12.14	0.99	0.333	66282
03/22/00 10:24	335.4	446.4	12.13	0.99	0.328	66180
03/22/00 10:25	334.9	444.1	N/A	N/A	0.328	66192
03/22/00 10:26	335.3	443.9	N/A	N/A	0.338	66120

03/22/00 10:27	333.7	443.5	N/A	N/A	0.336	66024
03/22/00 10:28	333.0	443.4	11.71	0.99	0.336	66048
03/22/00 10:29	332.7	443.4	11.86	0.99	0.337	66024
03/22/00 10:30	333.8	444.6	11.97	0.99	0.339	65544
03/22/00 10:31	333.5	444.2	12.00	0.99	N/A	65406
03/22/00 10:32	333.4	444.1	12.00	0.98	N/A	65418
03/22/00 10:33	332.7	442.0	12.02	0.98	0.328	65592
03/22/00 10:34	332.7	442.6	12.08	0.98	0.335	65970
03/22/00 10:35	331.8	442.7	12.09	0.98	0.340	66024
03/22/00 10:36	331.7	444.0	12.07	0.98	0.339	66150
03/22/00 10:37	333.7	446.2	12.04	0.98	0.337	66366
03/22/00 10:38	332.8	445.6	12.08	0.97	0.335	66366
03/22/00 10:39	333.3	446.8	12.10	0.97	0.332	66366
03/22/00 10:40	335.1	448.4	12.11	0.98	0.334	66594
03/22/00 10:41	336.7	449.5	12.11	0.98	0.334	66654
03/22/00 10:42	336.2	448.9	12.08	0.98	0.334	66654
03/22/00 10:43	336.1	447.5	12.10	0.98	0.342	66510
03/22/00 10:44	335.3	446.1	N/A	N/A	0.336	66156
03/22/00 10:45	334.8	445.6	N/A	N/A	0.331	66108
03/22/00 10:46	335.4	445.8	N/A	N/A	0.333	66108
03/22/00 10:47	336.4	446.5	11.80	1.03	0.328	66078
03/22/00 10:48	335.7	445.4	11.94	1.05	0.333	66054
03/22/00 10:49	334.6	444.0	12.07	1.05	N/A	66024
03/22/00 10:50	333.0	442.0	12.07	1.03	0.334	66048
03/22/00 10:51	334.1	442.6	12.04	1.03	0.331	66108
03/22/00 10:52	335.0	443.1	12.10	1.02	0.335	66108
03/22/00 10:53	334.3	442.1	12.06	1.02	0.341	66108
03/22/00 10:54	334.0	441.8	12.08	1.01	0.338	66006
03/22/00 10:55	334.2	442.1	12.05	1.01	0.332	65850
03/22/00 10:56	335.1	442.6	12.04	1.00	0.337	65850
03/22/00 10:57	336.3	442.7	12.07	1.00	0.335	65850
03/22/00 10:58	335.7	442.1	12.08	1.00	0.335	65550
03/22/00 10:59	335.8	442.3	12.09	1.00	0.335	65478
03/22/00 11:00	336.0	442.2	12.08	1.00	0.333	65502
03/22/00 11:01	336.1	442.5	12.07	1.00	0.335	64452
03/22/00 11:02	336.0	441.9	12.07	1.00	0.334	64476
03/22/00 11:03	336.9	442.4	N/A	N/A	0.331	64476
03/22/00 11:04	336.7	441.9	N/A	N/A	0.331	64476
03/22/00 11:05	335.8	440.9	11.74	1.00	0.335	64476
03/22/00 11:06	336.3	441.3	11.81	1.02	N/A	64476
03/22/00 11:07	336.9	442.0	11.94	1.02	N/A	64476
03/22/00 11:08	337.5	442.5	12.02	1.02	0.317	64476
03/22/00 11:09	337.8	442.8	12.08	1.01	0.322	64476
03/22/00 11:10	334.4	439.2	12.09	1.01	0.331	64458
03/22/00 11:11	332.0	436.7	12.08	1.01	0.337	64476
Final Average*	**333.9**	**440.1**	**12.02**	**1.00**	**0.321**	**65237**
Maximum*	**338.5**	**452.4**	**12.14**	**1.05**	**0.342**	**67824**
Minimum*	**330.0**	**432.8**	**11.52**	**0.97**	**0.289**	**63624**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 2
Run 1

Enertec NTDAHS®
Average Values Report
04/10/00 09:51

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123

Period Start: 03/23/00 12:45
Period End: 03/23/00 15:08
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit2Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_12 lb/MBT	Average Opacity12 %	Average StkFlow kscfm
03/23/00 12:45	56.3	12.15	0.92	0.420	9.7	1144.2
03/23/00 12:46	56.2	12.14	0.92	0.424	9.9	1144.2
03/23/00 12:47	56.4	12.18	0.92	N/A	10.3	1146.1
03/23/00 12:48	56.4	12.20	0.92	N/A	9.9	1149.9
03/23/00 12:49	56.3	12.17	0.93	0.425	10.0	1150.4
03/23/00 12:50	56.5	12.18	0.93	0.428	10.1	1150.4
03/23/00 12:51	56.4	12.19	0.93	0.429	9.3	1149.5
03/23/00 12:52	56.6	12.18	0.93	0.424	9.7	1145.2
03/23/00 12:53	56.7	12.22	0.93	0.414	9.5	1145.2
03/23/00 12:54	56.7	12.20	0.93	0.419	11.5	1145.2
03/23/00 12:55	56.6	N/A	N/A	0.426	9.8	1148.0
03/23/00 12:56	56.6	N/A	N/A	0.428	9.6	1148.5
03/23/00 12:57	56.7	N/A	N/A	0.422	10.8	1148.5
03/23/00 12:58	56.6	11.71	0.94	0.432	10.9	1138.1
03/23/00 12:59	56.5	11.94	0.94	0.437	10.4	1134.2
03/23/00 13:00	56.5	12.01	0.94	0.430	10.9	1134.2
03/23/00 13:01	56.6	12.06	0.93	0.436	10.8	1134.2
03/23/00 13:02	56.6	12.05	0.93	0.437	9.5	1132.1
03/23/00 13:03	56.5	12.13	0.93	0.432	9.1	1130.9
03/23/00 13:04	56.5	12.10	0.93	0.426	11.0	1130.9
03/23/00 13:05	56.5	12.11	0.93	N/A	9.5	1130.9
03/23/00 13:06	56.2	12.13	0.93	N/A	9.3	1130.9
03/23/00 13:07	56.6	12.10	0.93	0.394	9.2	1130.9
03/23/00 13:08	56.4	12.16	0.93	0.404	10.7	1130.9
03/23/00 13:09	56.7	12.17	0.93	0.408	9.4	1130.9
03/23/00 13:10	56.6	12.13	0.93	0.401	9.7	1130.9
03/23/00 13:11	56.7	12.11	0.93	0.399	10.2	1131.4
03/23/00 13:12	56.7	12.17	0.93	0.382	9.6	1131.4
03/23/00 13:13	56.3	12.22	0.93	0.381	9.7	1131.4
03/23/00 13:14	56.3	N/A	N/A	0.413	10.0	1133.1
03/23/00 13:15	56.3	N/A	N/A	0.433	9.3	1137.1
03/23/00 13:16	56.3	11.57	0.92	0.425	9.3	1137.1
03/23/00 13:17	56.4	11.76	0.92	0.415	9.0	1137.1
03/23/00 13:18	56.5	11.88	0.92	0.418	10.9	1136.6
03/23/00 13:19	56.4	11.98	0.91	0.419	9.4	1136.1
03/23/00 13:20	56.3	11.99	0.91	0.417	9.7	1136.1
03/23/00 13:21	56.3	12.02	0.91	0.417	11.5	1143.8
03/23/00 13:22	56.5	11.96	0.91	0.418	9.6	1144.2
03/23/00 13:23	56.8	12.03	0.91	N/A	10.0	1144.2
03/23/00 13:24	56.5	12.04	0.91	0.403	11.0	1146.1
03/23/00 13:25	56.7	12.04	0.92	0.413	12.0	1149.0
03/23/00 13:26	56.6	12.09	0.92	0.407	10.8	1149.0
03/23/00 13:27	56.5	12.09	0.93	0.395	10.6	1149.0
03/23/00 13:28	56.3	12.11	0.93	0.400	12.3	1153.3
03/23/00 13:29	56.5	12.08	0.93	0.406	12.0	1154.7
03/23/00 13:30	56.5	12.10	0.93	0.397	12.2	1154.7
03/23/00 13:31	56.4	12.03	0.92	0.379	11.2	1150.4
03/23/00 13:32	56.4	N/A	N/A	0.379	10.8	1149.5

03/23/00 13:33	56.6	N/A	N/A	0.382	9.9	1149.0
03/23/00 13:34	56.5	N/A	N/A	0.374	9.7	1147.6
03/23/00 13:35	56.7	11.56	0.94	0.377	9.3	1140.9
03/23/00 13:36	56.7	11.72	0.94	0.376	11.8	1140.9
03/23/00 13:37	56.5	11.80	0.94	0.369	10.4	1137.6
03/23/00 13:38	56.8	11.83	0.94	0.368	10.9	1124.2
03/23/00 13:39	56.7	11.91	0.93	0.375	9.9	1124.2
03/23/00 13:40	56.7	11.93	0.93	N/A	9.6	1124.2
03/23/00 13:41	56.6	11.94	0.93	N/A	9.7	1118.8
03/23/00 13:42	56.6	12.00	0.92	0.390	12.9	1116.6
03/23/00 13:43	56.6	11.95	0.92	0.396	10.4	1116.6
03/23/00 13:44	56.4	11.92	0.92	0.400	11.0	1120.9
03/23/00 13:45	56.5	11.97	0.92	0.378	11.2	1126.3
03/23/00 13:46	56.5	11.96	0.92	0.400	10.4	1127.5
03/23/00 13:47	56.4	12.01	0.93	0.374	9.6	1127.2
03/23/00 13:48	56.6	12.02	0.97	0.371	10.3	1135.6
03/23/00 13:49	56.3	12.08	1.01	0.383	10.3	1143.1
03/23/00 13:50	56.3	12.04	1.02	0.408	9.8	1144.2
03/23/00 13:51	56.3	N/A	N/A	0.394	9.1	1145.1
03/23/00 13:52	56.3	N/A	N/A	0.388	9.7	1148.5
03/23/00 13:53	56.3	N/A	N/A	0.388	11.2	1149.0
03/23/00 13:54	56.4	12.08	1.01	0.393	10.2	1149.0
03/23/00 13:55	56.4	12.22	1.01	0.405	11.1	1150.2
03/23/00 13:56	56.4	12.30	1.00	0.401	11.3	1150.9
03/23/00 13:57	56.8	12.33	1.00	0.415	9.9	1150.9
03/23/00 13:58	56.6	12.36	1.00	N/A	10.3	1154.2
03/23/00 13:59	56.8	12.31	1.00	N/A	11.0	1162.2
03/23/00 14:00	56.8	12.31	1.00	0.396	9.8	1163.3
03/23/00 14:01	56.6	12.29	0.99	0.389	10.1	1162.9
03/23/00 14:02	56.6	12.26	0.98	0.393	9.1	1169.3
03/23/00 14:03	56.6	12.23	0.98	0.402	10.2	1171.3
03/23/00 14:04	56.6	12.19	0.97	0.427	10.6	1171.4
03/23/00 14:05	56.6	12.17	0.95	0.429	9.9	1171.4
03/23/00 14:06	56.4	12.16	0.94	0.427	11.7	1171.4
03/23/00 14:07	56.4	12.10	0.94	0.432	9.7	1171.4
03/23/00 14:08	56.3	12.11	0.94	0.432	11.1	1171.4
03/23/00 14:09	56.3	12.11	0.94	0.439	11.7	1171.4
03/23/00 14:10	56.3	N/A	N/A	0.438	11.3	1166.1
03/23/00 14:11	56.4	N/A	N/A	0.436	10.2	1163.1
03/23/00 14:12	56.4	N/A	N/A	0.433	10.6	1163.3
03/23/00 14:13	56.4	11.59	0.96	0.432	10.3	1162.9
03/23/00 14:14	56.3	11.77	0.96	0.437	9.4	1133.7
03/23/00 14:15	56.4	11.85	0.96	0.435	8.9	1132.5
03/23/00 14:16	56.3	11.91	0.95	N/A	10.0	1127.8
03/23/00 14:17	56.6	11.92	0.95	N/A	10.4	1107.5
03/23/00 14:18	56.7	11.98	0.95	0.423	9.9	1104.7
03/23/00 14:19	56.6	12.01	0.95	0.421	9.0	1104.7
03/23/00 14:20	56.7	11.99	0.95	0.420	9.8	1100.2
03/23/00 14:21	56.7	11.99	0.95	0.420	9.9	1097.3
03/23/00 14:22	57.0	12.02	0.95	0.422	10.2	1097.0
03/23/00 14:23	56.9	12.04	0.95	0.425	12.1	1098.3
03/23/00 14:24	56.7	12.03	0.95	0.427	9.7	1103.7
03/23/00 14:25	56.7	12.08	0.95	0.428	9.6	1103.3
03/23/00 14:26	56.6	12.04	0.95	0.442	10.5	1103.7
03/23/00 14:27	56.6	12.01	0.95	0.459	10.4	1112.5
03/23/00 14:28	56.5	11.99	0.95	0.459	9.1	1115.8
03/23/00 14:29	56.5	N/A	N/A	0.453	8.3	1116.1
03/23/00 14:30	56.3	N/A	N/A	0.455	10.4	1118.0
03/23/00 14:31	56.1	11.45	0.96	0.457	9.3	1119.7
03/23/00 14:32	56.2	11.71	0.96	0.455	8.9	1119.9
03/23/00 14:33	56.3	11.87	0.96	N/A	10.1	1119.9
03/23/00 14:34	56.5	11.93	0.96	N/A	9.9	1118.7
03/23/00 14:35	56.5	12.01	0.96	0.455	8.7	1117.3
03/23/00 14:36	56.4	12.04	0.95	0.452	9.5	1117.1

03/23/00 14:37	56.4	12.05	0.95	0.448	9.5	1117.4
03/23/00 14:38	56.6	12.05	0.95	0.446	9.0	1117.5
03/23/00 14:39	56.7	12.04	0.95	0.443	8.9	1117.5
03/23/00 14:40	56.7	12.08	0.95	0.440	9.7	1117.5
03/23/00 14:41	56.7	12.09	0.95	0.447	9.3	1118.4
03/23/00 14:42	56.7	12.09	0.95	0.449	8.8	1118.5
03/23/00 14:43	56.6	12.08	0.95	0.450	8.9	1118.5
03/23/00 14:44	56.6	12.06	0.95	0.456	9.2	1121.3
03/23/00 14:45	56.6	12.07	0.95	0.449	9.2	1132.7
03/23/00 14:46	56.5	12.09	0.96	0.448	8.7	1134.2
03/23/00 14:47	56.5	N/A	N/A	0.450	9.6	1134.6
03/23/00 14:48	56.5	N/A	N/A	0.448	9.7	1137.1
03/23/00 14:49	56.5	N/A	N/A	0.437	9.3	1137.1
03/23/00 14:50	56.3	11.54	0.98	0.428	9.9	1137.1
03/23/00 14:51	56.3	11.69	0.98	N/A	10.1	1140.4
03/23/00 14:52	56.2	11.86	0.98	N/A	9.1	1141.7
03/23/00 14:53	56.0	11.94	0.98	0.431	8.9	1141.8
03/23/00 14:54	56.3	12.01	0.97	0.434	11.1	1131.4
03/23/00 14:55	56.1	12.00	0.97	0.443	9.0	1117.6
03/23/00 14:56	56.3	12.03	0.97	0.446	9.4	1115.6
03/23/00 14:57	56.6	12.02	0.97	0.440	9.2	1114.8
03/23/00 14:58	57.0	12.08	0.96	0.433	9.9	1106.6
03/23/00 14:59	57.1	12.07	0.96	0.432	9.7	1106.6
03/23/00 15:00	57.1	12.06	0.97	0.434	9.7	1106.2
03/23/00 15:01	56.9	12.10	0.97	0.445	9.8	1099.0
03/23/00 15:02	56.7	12.13	0.97	0.455	9.1	1093.7
03/23/00 15:03	56.4	12.09	0.97	0.455	8.8	1093.7
03/23/00 15:04	56.3	12.10	0.97	0.453	9.6	1094.2
03/23/00 15:05	56.3	12.09	0.97	0.467	10.1	1093.8
03/23/00 15:06	56.4	N/A	N/A	0.467	9.2	1093.7
03/23/00 15:07	56.7	N/A	N/A	0.453	9.9	1093.7
Final Average*	**56.5**	**12.03**	**0.95**	**0.421**	**10.0**	**1133.4**
Maximum*	**57.1**	**12.36**	**1.02**	**0.467**	**12.9**	**1171.4**
Minimum*	**56.0**	**11.45**	**0.91**	**0.368**	**8.3**	**1093.7**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 2
Run 2

Enertec NTDAHS®
Average Values Report
04/10/00 09:52

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123

Period Start: 03/24/00 08:20
Period End: 03/24/00 10:40
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit2Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_12 lb/MBT	Average Opacity12 %	Average StkFlow kscfm
03/24/00 08:20	56.8	12.11	0.88	0.414	9.9	1088.5
03/24/00 08:21	56.7	12.13	0.87	0.419	9.7	1083.7
03/24/00 08:22	56.2	12.17	0.87	N/A	10.1	1066.5
03/24/00 08:23	56.7	12.16	0.87	N/A	10.2	1066.5
03/24/00 08:24	56.5	12.14	0.87	0.420	9.7	1067.0
03/24/00 08:25	56.4	12.15	0.87	0.420	10.6	1069.4
03/24/00 08:26	56.6	12.14	0.86	0.425	9.6	1069.4
03/24/00 08:27	56.4	12.15	0.87	0.423	9.8	1070.0
03/24/00 08:28	56.5	12.14	0.86	0.417	10.3	1070.8
03/24/00 08:29	56.3	12.14	0.86	0.419	10.5	1071.8
03/24/00 08:30	56.7	12.18	0.86	0.419	9.6	1071.8
03/24/00 08:31	56.5	12.18	0.87	0.417	9.7	1076.6
03/24/00 08:32	56.6	N/A	0.87	0.419	11.6	1092.8
03/24/00 08:33	56.8	N/A	N/A	0.418	9.9	1092.8
03/24/00 08:34	56.7	N/A	N/A	0.417	9.9	1092.8
03/24/00 08:35	56.7	11.65	0.89	0.409	9.7	1097.0
03/24/00 08:36	56.8	11.83	0.89	0.415	11.8	1099.4
03/24/00 08:37	56.8	12.00	0.90	0.416	9.7	1099.4
03/24/00 08:38	56.6	12.10	0.89	0.419	10.0	1099.0
03/24/00 08:39	56.8	12.13	0.89	0.419	9.7	1094.7
03/24/00 08:40	56.7	12.16	0.89	N/A	9.6	1094.7
03/24/00 08:41	56.6	12.18	0.88	N/A	9.5	1094.7
03/24/00 08:42	56.7	12.16	0.88	0.419	10.3	1089.4
03/24/00 08:43	56.7	12.21	0.88	0.423	10.0	1088.5
03/24/00 08:44	56.9	12.20	0.88	0.424	9.4	1088.5
03/24/00 08:45	56.7	12.17	0.88	0.419	9.9	1089.4
03/24/00 08:46	56.5	12.18	0.88	0.421	10.7	1092.8
03/24/00 08:47	56.6	12.18	0.88	0.423	9.3	1092.8
03/24/00 08:48	56.7	12.20	0.88	0.424	9.6	1092.8
03/24/00 08:49	56.4	12.15	0.88	0.426	9.2	1102.0
03/24/00 08:50	56.4	12.17	0.88	0.433	9.5	1103.7
03/24/00 08:51	56.0	N/A	N/A	0.436	10.0	1103.8
03/24/00 08:52	56.5	N/A	N/A	0.433	10.6	1104.2
03/24/00 08:53	56.6	N/A	N/A	0.434	10.2	1104.7
03/24/00 08:54	56.8	11.76	0.90	0.431	9.6	1104.3
03/24/00 08:55	57.0	11.94	0.89	0.426	10.0	1102.8
03/24/00 08:56	57.0	12.02	0.89	0.420	10.8	1096.6
03/24/00 08:57	57.1	12.12	0.89	0.418	9.9	1097.0
03/24/00 08:58	56.9	12.14	0.89	N/A	9.7	1097.0
03/24/00 08:59	56.9	12.12	0.89	0.429	9.6	1094.2
03/24/00 09:00	56.7	12.14	0.89	0.437	11.6	1093.8
03/24/00 09:01	57.0	12.13	0.88	0.443	9.5	1093.7
03/24/00 09:02	56.9	12.16	0.88	0.442	9.6	1096.1
03/24/00 09:03	56.8	12.18	0.88	0.442	9.9	1101.8
03/24/00 09:04	56.3	12.15	0.88	0.448	10.3	1101.8
03/24/00 09:05	56.5	12.17	0.88	0.454	9.3	1101.8
03/24/00 09:06	56.4	12.19	0.88	0.447	9.8	1101.3
03/24/00 09:07	56.8	12.21	0.88	0.450	11.2	1101.3

03/24/00 09:08	56.6	12.14	0.88	0.444	10.9	1101.8
03/24/00 09:09	56.5	12.20	0.88	0.433	11.4	1101.3
03/24/00 09:10	56.6	N/A	N/A	0.424	11.7	1122.3
03/24/00 09:11	56.8	N/A	N/A	0.414	10.7	1126.1
03/24/00 09:12	56.7	N/A	N/A	0.407	11.3	1126.3
03/24/00 09:13	56.5	11.89	0.89	0.393	12.1	1127.5
03/24/00 09:14	56.9	12.13	0.90	0.390	11.9	1136.0
03/24/00 09:15	56.7	12.19	0.90	N/A	10.9	1137.6
03/24/00 09:16	56.5	12.27	0.89	N/A	10.6	1137.6
03/24/00 09:17	57.0	12.28	0.90	0.406	12.8	1144.2
03/24/00 09:18	56.7	12.32	0.90	0.417	12.2	1145.7
03/24/00 09:19	56.9	12.31	0.89	0.415	10.9	1145.7
03/24/00 09:20	56.8	12.31	0.89	0.413	11.8	1145.7
03/24/00 09:21	56.8	12.35	0.89	0.418	10.7	1131.4
03/24/00 09:22	56.5	12.28	0.89	0.421	10.5	1131.0
03/24/00 09:23	56.7	12.36	0.89	0.425	10.9	1130.9
03/24/00 09:24	57.1	12.30	0.89	0.434	12.2	1131.3
03/24/00 09:25	56.7	12.27	0.88	0.443	10.4	1133.7
03/24/00 09:26	56.9	12.28	0.88	0.441	10.7	1133.7
03/24/00 09:27	56.7	12.27	0.88	0.445	10.7	1133.7
03/24/00 09:28	56.4	12.32	0.88	0.451	10.5	1142.9
03/24/00 09:29	56.8	N/A	N/A	0.447	10.0	1144.2
03/24/00 09:30	56.7	N/A	N/A	0.442	10.1	1144.2
03/24/00 09:31	56.8	N/A	N/A	0.444	11.4	1145.2
03/24/00 09:32	56.5	11.93	0.89	0.443	10.8	1145.7
03/24/00 09:33	56.6	12.10	0.89	N/A	9.5	1145.7
03/24/00 09:34	56.5	12.11	0.89	N/A	9.9	1143.6
03/24/00 09:35	56.3	12.18	0.88	0.449	11.1	1138.5
03/24/00 09:36	56.5	12.20	0.88	0.451	9.9	1138.9
03/24/00 09:37	56.4	12.20	0.88	0.448	10.8	1138.5
03/24/00 09:38	56.4	12.23	0.88	0.455	10.4	1134.3
03/24/00 09:39	56.5	12.20	0.88	0.456	9.6	1133.7
03/24/00 09:40	56.4	12.19	0.88	0.456	9.8	1133.7
03/24/00 09:41	56.3	12.28	0.88	0.458	10.1	1133.7
03/24/00 09:42	56.8	12.25	0.88	0.458	9.6	1134.2
03/24/00 09:43	56.8	12.22	0.88	0.453	9.4	1134.2
03/24/00 09:44	56.9	12.25	0.88	0.449	10.1	1135.9
03/24/00 09:45	56.8	12.25	0.88	0.449	13.9	1139.9
03/24/00 09:46	57.0	12.23	0.88	0.450	10.3	1139.9
03/24/00 09:47	57.1	N/A	N/A	0.439	10.4	1139.9
03/24/00 09:48	56.8	N/A	N/A	0.433	11.9	1136.6
03/24/00 09:49	56.9	N/A	N/A	0.436	9.8	1135.2
03/24/00 09:50	56.8	11.78	0.89	0.438	10.4	1135.2
03/24/00 09:51	56.6	11.96	0.89	N/A	10.7	1137.1
03/24/00 09:52	56.7	12.07	0.89	0.432	10.1	1140.9
03/24/00 09:53	56.7	12.19	0.88	0.426	9.4	1140.9
03/24/00 09:54	56.6	12.21	0.88	0.421	9.6	1140.9
03/24/00 09:55	56.7	12.26	0.89	0.428	10.7	1137.6
03/24/00 09:56	56.6	12.30	0.89	0.439	10.0	1134.2
03/24/00 09:57	56.7	12.29	0.89	0.434	9.7	1134.2
03/24/00 09:58	56.6	12.31	0.89	0.435	10.6	1134.2
03/24/00 09:59	56.5	12.30	0.89	0.440	10.4	1133.7
03/24/00 10:00	56.4	12.28	0.88	0.438	10.3	1133.7
03/24/00 10:01	56.3	12.22	0.88	0.438	9.7	1135.6
03/24/00 10:02	56.6	12.25	0.88	0.443	10.8	1139.9
03/24/00 10:03	56.4	12.32	0.89	0.440	10.1	1139.9
03/24/00 10:04	56.7	12.29	0.89	0.435	10.5	1139.9
03/24/00 10:05	57.0	12.30	0.89	0.439	10.6	1139.5
03/24/00 10:06	56.8	N/A	N/A	0.441	9.8	1139.5
03/24/00 10:07	56.8	N/A	N/A	0.442	9.5	1139.5
03/24/00 10:08	56.7	N/A	N/A	N/A	11.2	1139.9
03/24/00 10:09	56.8	11.81	0.90	N/A	10.7	1139.9
03/24/00 10:10	56.8	11.97	0.89	0.442	10.1	1139.9
03/24/00 10:11	56.6	12.08	0.89	0.440	9.3	1144.2

03/24/00 10:12	56.9	12.13	0.89	0.442	12.4	1148.5
03/24/00 10:13	56.8	12.13	0.89	0.444	10.8	1149.0
03/24/00 10:14	56.7	12.22	0.89	0.446	9.9	1148.6
03/24/00 10:15	56.5	12.21	0.88	0.446	9.6	1145.7
03/24/00 10:16	56.5	12.21	0.88	0.454	9.7	1145.7
03/24/00 10:17	56.6	12.20	0.88	0.456	9.8	1145.7
03/24/00 10:18	56.5	12.19	0.88	0.453	9.4	1144.2
03/24/00 10:19	56.5	12.21	0.88	0.454	10.9	1137.6
03/24/00 10:20	56.6	12.18	0.87	0.456	10.1	1137.6
03/24/00 10:21	56.7	12.23	0.87	0.454	10.0	1137.1
03/24/00 10:22	56.8	12.20	0.87	0.454	10.1	1136.6
03/24/00 10:23	56.8	12.22	0.86	0.457	9.9	1136.6
03/24/00 10:24	56.7	12.18	0.86	0.453	9.9	1136.6
03/24/00 10:25	56.8	N/A	N/A	0.450	10.0	1137.1
03/24/00 10:26	57.2	N/A	N/A	N/A	10.3	1137.1
03/24/00 10:27	57.2	N/A	N/A	N/A	10.0	1137.6
03/24/00 10:28	56.9	11.84	0.89	0.441	9.6	1137.1
03/24/00 10:29	56.9	11.99	0.90	0.448	10.5	1138.0
03/24/00 10:30	56.7	12.14	0.90	0.454	10.6	1138.0
03/24/00 10:31	56.8	12.16	0.89	0.456	9.6	1138.5
03/24/00 10:32	56.8	12.18	0.88	0.453	10.5	1141.8
03/24/00 10:33	57.0	12.17	0.87	0.454	10.6	1142.3
03/24/00 10:34	56.5	12.14	0.87	0.450	9.7	1142.7
03/24/00 10:35	56.6	12.11	0.87	0.442	10.4	1143.2
03/24/00 10:36	56.9	12.10	0.87	0.444	12.6	1143.8
03/24/00 10:37	56.6	12.11	0.87	0.446	9.5	1143.8
03/24/00 10:38	56.3	12.15	0.87	0.443	9.6	1143.4
03/24/00 10:39	56.6	12.15	0.87	0.442	9.5	1141.6
Final Average*	**56.7**	**12.16**	**0.88**	**0.435**	**10.3**	**1121.7**
Maximum*	**57.2**	**12.36**	**0.90**	**0.458**	**13.9**	**1149.0**
Minimum*	**56.0**	**11.65**	**0.86**	**0.390**	**9.2**	**1066.5**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 2
Run 3

Enertec NTDAHS®
Average Values Report
04/10/00 09:53

Company: Minnesota Power
Plant: Boswell 1, 2, 3
City/St: Cohasset, MN
Source: UNIT_123

Period Start: 03/24/00 12:30
Period End: 03/24/00 14:45
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit2Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxmmb_12 lb/MBT	Average Opacity12 %	Average StkFlow kscfm
03/24/00 12:30	56.3	12.03	0.95	N/A	11.0	1082.8
03/24/00 12:31	56.6	12.00	0.93	N/A	9.7	1052.7
03/24/00 12:32	56.1	12.02	0.92	0.453	9.6	1051.3
03/24/00 12:33	56.3	12.03	0.92	0.457	11.9	1051.3
03/24/00 12:34	56.2	12.04	0.91	0.460	9.9	1052.5
03/24/00 12:35	56.6	12.03	0.91	0.459	10.0	1054.6
03/24/00 12:36	56.9	N/A	N/A	0.458	11.1	1054.6
03/24/00 12:37	56.2	N/A	N/A	0.460	10.3	1055.9
03/24/00 12:38	56.9	N/A	N/A	0.458	9.6	1057.5
03/24/00 12:39	57.2	11.73	0.90	0.454	11.0	1057.0
03/24/00 12:40	57.5	11.86	0.90	0.456	10.2	1057.4
03/24/00 12:41	57.3	12.02	0.89	0.455	9.3	1060.4
03/24/00 12:42	57.5	12.04	0.89	0.450	9.2	1062.9
03/24/00 12:43	56.9	12.10	0.89	0.446	10.3	1062.7
03/24/00 12:44	57.0	12.04	0.90	0.450	10.4	1066.3
03/24/00 12:45	56.9	12.11	0.90	0.452	9.5	1077.0
03/24/00 12:46	56.5	12.11	0.90	0.451	9.1	1077.0
03/24/00 12:47	56.4	12.14	0.90	0.454	11.1	1077.0
03/24/00 12:48	56.5	12.14	0.90	N/A	9.6	1083.7
03/24/00 12:49	56.3	12.10	0.89	N/A	10.3	1085.1
03/24/00 12:50	56.2	12.10	0.89	0.464	10.4	1085.1
03/24/00 12:51	56.3	12.15	0.89	0.462	9.3	1088.5
03/24/00 12:52	56.5	12.15	0.90	0.457	10.0	1094.3
03/24/00 12:53	56.3	12.13	0.90	0.455	10.8	1095.6
03/24/00 12:54	56.2	12.11	0.90	0.459	10.0	1094.8
03/24/00 12:55	56.5	N/A	N/A	0.457	9.6	1093.7
03/24/00 12:56	56.5	N/A	N/A	0.455	8.8	1093.7
03/24/00 12:57	56.8	N/A	N/A	0.453	12.0	1093.7
03/24/00 12:58	56.7	11.72	0.91	0.457	10.4	1102.8
03/24/00 12:59	56.5	11.98	0.90	0.454	10.4	1103.7
03/24/00 13:00	56.7	12.04	0.90	0.454	10.9	1103.7
03/24/00 13:01	57.0	12.15	0.89	0.457	10.7	1106.1
03/24/00 13:02	56.8	12.15	0.89	0.457	10.3	1110.9
03/24/00 13:03	56.7	12.18	0.89	0.453	9.9	1110.9
03/24/00 13:04	56.8	12.21	0.89	0.456	9.8	1110.9
03/24/00 13:05	56.6	12.15	0.89	N/A	9.6	1110.9
03/24/00 13:06	56.8	12.18	0.88	N/A	9.2	1110.9
03/24/00 13:07	56.6	12.18	0.88	0.461	9.7	1110.9
03/24/00 13:08	56.5	12.24	0.88	0.465	9.6	1110.9
03/24/00 13:09	56.3	12.19	0.88	0.471	9.3	1110.9
03/24/00 13:10	56.5	12.19	0.88	0.462	9.9	1118.5
03/24/00 13:11	56.7	12.16	0.88	0.457	10.4	1122.8
03/24/00 13:12	56.6	12.16	0.88	0.453	10.1	1122.6
03/24/00 13:13	56.8	12.20	0.88	0.453	9.6	1121.4
03/24/00 13:14	56.7	N/A	N/A	0.457	10.0	1117.5
03/24/00 13:15	56.8	N/A	N/A	0.458	10.2	1117.1
03/24/00 13:16	56.3	11.58	0.89	0.456	9.8	1117.5
03/24/00 13:17	56.7	11.83	0.90	0.455	10.1	1109.0

03/24/00 13:18	56.6	12.03	0.90	0.460	9.9	1105.6
03/24/00 13:19	56.7	12.12	0.90	0.462	9.7	1105.6
03/24/00 13:20	56.4	12.15	0.89	0.460	9.8	1107.5
03/24/00 13:21	56.8	12.20	0.90	0.459	12.0	1109.4
03/24/00 13:22	56.5	12.23	0.90	0.460	9.7	1109.4
03/24/00 13:23	56.9	12.22	0.89	N/A	9.5	1109.4
03/24/00 13:24	56.9	12.20	0.89	N/A	10.1	1110.3
03/24/00 13:25	56.7	12.25	0.88	0.467	11.3	1110.4
03/24/00 13:26	57.0	12.21	0.88	0.467	9.9	1109.9
03/24/00 13:27	56.7	12.20	0.88	0.467	10.0	1116.1
03/24/00 13:28	56.8	12.20	0.88	0.471	10.2	1121.1
03/24/00 13:29	56.6	12.22	0.88	0.474	9.3	1121.8
03/24/00 13:30	56.7	12.20	0.88	0.472	9.8	1111.8
03/24/00 13:31	56.8	12.20	0.87	0.469	10.2	1104.2
03/24/00 13:32	56.8	N/A	N/A	0.474	9.9	1104.2
03/24/00 13:33	56.8	N/A	N/A	0.483	9.9	1104.2
03/24/00 13:34	56.8	N/A	N/A	0.486	9.7	1108.0
03/24/00 13:35	56.4	11.74	0.84	0.497	10.0	1109.4
03/24/00 13:36	56.6	11.99	0.85	0.510	9.8	1109.4
03/24/00 13:37	56.8	12.14	0.85	0.507	9.8	1101.3
03/24/00 13:38	56.4	12.20	0.85	0.507	10.0	1092.3
03/24/00 13:39	56.5	12.26	0.84	0.507	9.9	1092.3
03/24/00 13:40	56.8	12.19	0.84	0.501	9.6	1092.3
03/24/00 13:41	56.6	12.21	0.84	N/A	9.8	1108.5
03/24/00 13:42	56.7	12.19	0.84	N/A	10.6	1109.9
03/24/00 13:43	56.7	12.22	0.83	0.474	10.0	1109.9
03/24/00 13:44	56.6	12.24	0.83	0.475	10.4	1106.1
03/24/00 13:45	56.7	12.23	0.83	0.473	11.4	1102.3
03/24/00 13:46	56.6	12.16	0.83	0.482	10.0	1102.3
03/24/00 13:47	56.7	12.18	0.82	0.485	10.2	1105.6
03/24/00 13:48	56.6	12.20	0.82	0.476	11.2	1123.3
03/24/00 13:49	56.3	12.21	0.82	0.474	10.4	1123.3
03/24/00 13:50	56.5	12.16	0.82	0.474	10.0	1123.3
03/24/00 13:51	56.6	N/A	N/A	0.470	9.1	1119.4
03/24/00 13:52	56.7	N/A	N/A	0.473	10.2	1119.0
03/24/00 13:53	56.7	N/A	N/A	0.479	10.2	1119.4
03/24/00 13:54	56.6	11.72	0.86	0.483	9.7	1122.6
03/24/00 13:55	56.3	11.97	0.85	0.480	10.1	1128.5
03/24/00 13:56	56.6	12.06	0.85	0.483	9.8	1128.4
03/24/00 13:57	56.5	12.15	0.84	0.484	10.0	1128.0
03/24/00 13:58	56.3	12.16	0.84	N/A	10.3	1127.5
03/24/00 13:59	56.1	12.18	0.83	N/A	10.4	1127.5
03/24/00 14:00	56.1	12.19	0.83	0.500	9.9	1127.5
03/24/00 14:01	56.2	12.16	0.83	0.497	9.8	1130.9
03/24/00 14:02	56.5	12.17	0.83	0.489	10.2	1131.8
03/24/00 14:03	56.4	12.18	0.83	0.487	9.8	1131.8
03/24/00 14:04	56.7	12.16	0.83	0.481	10.1	1131.8
03/24/00 14:05	56.7	12.24	0.83	0.473	10.1	1131.4
03/24/00 14:06	56.9	12.20	0.84	0.471	10.3	1131.8
03/24/00 14:07	56.9	12.26	0.84	0.475	9.9	1131.8
03/24/00 14:08	56.9	12.22	0.83	0.474	9.2	1131.8
03/24/00 14:09	57.2	12.17	0.83	0.471	11.8	1131.4
03/24/00 14:10	56.9	N/A	N/A	0.471	10.6	1129.9
03/24/00 14:11	57.1	N/A	N/A	0.480	10.6	1126.6
03/24/00 14:12	57.0	N/A	N/A	0.488	11.8	1126.6
03/24/00 14:13	56.8	11.83	0.84	0.480	12.0	1126.6
03/24/00 14:14	57.1	12.05	0.84	0.484	14.0	1120.7
03/24/00 14:15	56.8	12.13	0.85	0.473	14.5	1119.4
03/24/00 14:16	56.7	12.13	0.86	N/A	11.8	1119.9
03/24/00 14:17	56.6	12.13	0.87	N/A	10.9	1116.1
03/24/00 14:18	56.5	12.14	0.86	0.483	10.9	1115.7
03/24/00 14:19	56.5	12.15	0.86	0.478	12.9	1115.6
03/24/00 14:20	56.4	12.16	0.86	0.473	12.8	1115.6
03/24/00 14:21	56.4	12.14	0.86	0.483	11.2	1120.4

03/24/00 14:22	56.5	12.18	0.86	0.486	11.2	1121.4
03/24/00 14:23	56.4	12.18	0.85	0.485	12.3	1121.4
03/24/00 14:24	56.5	12.15	0.85	0.472	11.4	1133.5
03/24/00 14:25	56.7	12.17	0.85	0.439	11.2	1137.6
03/24/00 14:26	56.4	12.15	0.84	0.433	11.7	1137.6
03/24/00 14:27	56.7	12.19	0.84	0.437	10.9	1137.6
03/24/00 14:28	56.8	12.13	0.84	0.439	12.2	1135.6
03/24/00 14:29	56.6	N/A	N/A	0.439	11.4	1135.6
03/24/00 14:30	56.8	N/A	N/A	0.440	11.1	1131.8
03/24/00 14:31	56.7	11.67	0.84	0.446	10.1	1124.7
03/24/00 14:32	56.8	11.89	0.85	0.451	10.9	1125.2
03/24/00 14:33	56.6	12.08	0.85	0.455	13.3	1124.7
03/24/00 14:34	56.9	12.14	0.85	N/A	11.2	1118.0
03/24/00 14:35	56.9	12.16	0.84	N/A	10.2	1104.3
03/24/00 14:36	57.1	12.18	0.83	0.442	10.5	1102.3
03/24/00 14:37	56.9	12.15	0.83	0.448	11.9	1102.3
03/24/00 14:38	56.8	12.19	0.83	0.450	9.8	1103.2
03/24/00 14:39	56.8	12.22	0.83	0.444	11.2	1103.2
03/24/00 14:40	56.7	12.23	0.84	0.445	11.2	1103.2
03/24/00 14:41	56.6	12.19	0.84	0.460	10.9	1106.6
03/24/00 14:42	56.4	12.19	0.83	0.468	11.3	1107.1
03/24/00 14:43	56.5	12.22	0.83	0.465	11.7	1107.1
03/24/00 14:44	56.6	12.20	0.83	0.469	10.6	1107.1
Final Average*	**56.7**	**12.12**	**0.87**	**0.467**	**10.5**	**1107.2**
Maximum*	**57.5**	**12.26**	**0.95**	**0.510**	**14.5**	**1137.6**
Minimum*	**56.1**	**11.58**	**0.82**	**0.433**	**8.8**	**1051.3**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 1

Enertec NTDAHS®
Average Values Report
04/10/00 08:58

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/27/00 17:00
Period End: 03/27/00 20:47
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit4Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxlbmbtu lb/MBT	Average StkFlwHrA kscfh	Average StkTemp degF
03/27/00 17:00	556.6	12.28	0.12	0.275	87762	158.5
03/27/00 17:01	554.8	12.26	0.12	0.275	87768	158.5
03/27/00 17:02	550.3	12.26	0.12	0.275	87774	158.4
03/27/00 17:03	550.7	12.22	0.12	0.276	87798	158.4
03/27/00 17:04	548.6	12.18	0.12	0.276	87774	158.5
03/27/00 17:05	543.3	12.23	0.12	0.276	87756	158.4
03/27/00 17:06	539.9	12.22	0.12	0.274	87828	158.5
03/27/00 17:07	538.5	12.24	0.12	0.272	88020	158.8
03/27/00 17:08	540.9	12.21	0.11	0.269	87984	158.8
03/27/00 17:09	543.4	12.18	0.11	0.266	88002	158.8
03/27/00 17:10	543.8	12.18	0.11	0.261	87270	158.8
03/27/00 17:11	544.6	12.16	0.11	0.258	86850	158.6
03/27/00 17:12	545.8	12.22	0.11	0.257	86838	158.6
03/27/00 17:13	547.5	12.20	0.11	0.258	86898	158.8
03/27/00 17:14	546.7	12.17	0.11	0.262	86976	159.0
03/27/00 17:15	545.5	12.21	0.11	0.263	86964	158.9
03/27/00 17:16	544.0	12.21	0.11	0.263	86970	159.0
03/27/00 17:17	544.2	12.22	0.11	0.262	86718	158.9
03/27/00 17:18	544.6	12.22	0.11	0.260	86538	158.9
03/27/00 17:19	545.8	12.27	0.11	0.257	86526	158.9
03/27/00 17:20	546.7	12.37	0.11	0.256	86550	158.9
03/27/00 17:21	547.4	12.38	0.11	0.255	86616	159.0
03/27/00 17:22	548.3	12.39	0.11	0.256	86628	158.9
03/27/00 17:23	551.5	12.34	0.11	0.260	86472	158.9
03/27/00 17:24	551.4	12.18	0.11	0.263	85902	158.6
03/27/00 17:25	550.3	12.27	0.11	0.260	85866	158.6
03/27/00 17:26	552.1	12.27	0.11	0.260	85884	158.6
03/27/00 17:27	554.3	12.27	0.11	0.261	86016	158.5
03/27/00 17:28	556.8	12.27	0.11	0.261	86016	158.5
03/27/00 17:29	560.1	12.31	0.11	0.263	86028	158.4
03/27/00 17:30	561.6	12.33	0.11	0.266	86532	158.6
03/27/00 17:31	560.1	12.34	0.11	0.266	86814	158.8
03/27/00 17:32	559.2	12.36	0.12	0.268	86826	158.8
03/27/00 17:33	558.5	12.31	0.12	0.270	86826	158.8
03/27/00 17:34	558.0	12.31	0.12	0.272	86832	158.8
03/27/00 17:35	557.6	12.29	0.12	0.272	86844	158.8
03/27/00 17:36	559.0	12.32	0.12	0.270	86826	158.8
03/27/00 17:37	558.6	12.36	0.12	0.269	86976	158.8
03/27/00 17:38	556.8	12.36	0.12	0.269	87090	158.9
03/27/00 17:39	559.1	12.34	0.12	0.269	87066	158.8
03/27/00 17:40	559.9	12.34	0.12	0.270	86934	158.9
03/27/00 17:41	560.4	12.31	0.12	0.271	86688	158.9
03/27/00 17:42	560.5	12.37	0.12	0.270	86688	158.9
03/27/00 17:43	559.0	12.35	0.12	0.270	86676	158.9
03/27/00 17:44	557.4	12.34	0.12	0.272	87228	158.9
03/27/00 17:45	557.5	12.32	0.12	0.272	87582	158.9
03/27/00 17:46	559.9	12.32	0.12	0.273	87564	158.9
03/27/00 17:47	559.5	12.31	0.12	0.273	87804	159.0

03/27/00 17:48	559.2	12.33	0.12	0.273	88080	159.3
03/27/00 17:49	559.0	12.31	0.12	0.272	88074	159.2
03/27/00 17:50	558.7	12.35	0.12	0.272	88092	159.2
03/27/00 17:51	556.1	12.35	0.12	0.271	88368	159.3
03/27/00 17:52	553.9	12.36	0.12	0.272	88488	159.2
03/27/00 17:53	548.8	12.27	0.12	0.274	88446	159.2
03/27/00 17:54	546.0	12.27	0.12	0.274	88104	159.2
03/27/00 17:55	542.6	12.27	0.11	0.272	87510	159.2
03/27/00 17:56	539.5	12.29	0.11	0.270	87546	159.2
03/27/00 17:57	536.7	12.31	0.11	0.265	87528	159.2
03/27/00 17:58	535.6	12.38	0.11	0.260	86382	158.9
03/27/00 17:59	534.6	12.36	0.11	0.257	85998	158.7
03/27/00 18:00	534.6	12.38	0.11	0.253	85980	158.7
03/27/00 18:01	534.7	12.36	0.11	0.252	86010	158.5
03/27/00 18:02	536.0	12.35	0.11	0.253	86016	158.7
03/27/00 18:03	537.0	12.35	0.11	0.251	85986	158.6
03/27/00 18:04	536.3	12.34	0.11	0.252	86004	158.7
03/27/00 18:05	534.1	12.34	0.11	0.253	86016	158.7
03/27/00 18:06	532.5	12.37	0.11	0.254	85806	158.5
03/27/00 18:07	532.2	12.36	0.11	0.252	84468	158.2
03/27/00 18:08	532.3	12.33	0.11	0.251	84468	158.1
03/27/00 18:09	531.8	12.39	0.11	0.250	84444	158.2
03/27/00 18:10	530.4	12.38	0.11	0.249	83832	157.8
03/27/00 18:11	529.8	12.36	0.11	0.247	83190	157.6
03/27/00 18:12	528.6	12.35	0.11	0.246	83208	157.5
03/27/00 18:13	527.3	12.32	0.11	0.244	83190	157.6
03/27/00 18:14	526.6	12.04	0.11	0.247	83190	157.6
03/27/00 18:15	526.2	12.30	0.10	0.242	83196	157.5
03/27/00 18:16	525.8	12.49	0.09	0.240	82446	155.6
03/27/00 18:17	526.5	12.63	0.08	0.238	81696	152.4
03/27/00 18:18	526.3	12.76	0.08	0.235	81444	150.5
03/27/00 18:19	527.3	12.82	0.08	0.235	79662	145.0
03/27/00 18:20	527.9	12.80	0.08	0.236	79668	145.1
03/27/00 18:21	528.4	12.80	0.08	0.236	79668	145.0
03/27/00 18:22	528.4	12.82	0.08	0.237	79248	140.7
03/27/00 18:23	528.4	12.79	0.08	0.237	78990	138.1
03/27/00 18:24	528.5	12.84	0.08	0.237	79008	138.1
03/27/00 18:25	528.1	12.81	0.08	0.237	78984	137.3
03/27/00 18:26	529.1	12.85	0.08	0.237	79014	136.7
03/27/00 18:27	531.3	12.79	0.08	0.237	79014	136.7
03/27/00 18:28	533.1	12.81	0.08	0.237	79122	136.9
03/27/00 18:29	536.7	12.82	0.08	0.237	79530	137.5
03/27/00 18:30	539.5	12.82	0.08	0.237	79542	137.5
03/27/00 18:31	542.8	12.78	0.08	0.240	79554	137.5
03/27/00 18:32	547.6	12.82	0.08	0.242	79650	137.7
03/27/00 18:33	550.5	12.79	0.08	0.246	80532	138.5
03/27/00 18:34	550.6	12.84	0.09	0.249	80550	138.5
03/27/00 18:35	550.7	12.83	0.09	0.251	80574	138.7
03/27/00 18:36	550.3	12.70	0.09	0.255	80772	138.9
03/27/00 18:37	549.6	12.72	0.09	0.255	82380	140.6
03/27/00 18:38	548.1	12.73	0.09	0.255	82380	140.6
03/27/00 18:39	548.1	12.66	0.09	0.255	82626	140.9
03/27/00 18:40	548.4	12.70	0.09	0.256	84060	142.4
03/27/00 18:41	549.7	12.71	0.09	0.256	84030	142.3
03/27/00 18:42	550.3	12.77	0.09	0.257	84042	142.4
03/27/00 18:43	550.2	12.75	0.09	0.258	84054	142.4
03/27/00 18:44	550.2	12.74	0.10	0.260	83916	143.7
03/27/00 18:45	550.0	12.68	0.10	0.260	83886	143.9
03/27/00 18:46	549.5	12.71	0.10	0.260	83892	143.9
03/27/00 18:47	549.0	12.67	0.10	0.261	83724	144.3
03/27/00 18:48	548.5	12.68	0.10	0.262	83574	144.5
03/27/00 18:49	548.5	12.67	0.10	0.262	83586	144.5
03/27/00 18:50	549.2	12.68	0.10	0.262	83526	144.9
03/27/00 18:51	549.3	12.64	0.10	0.262	83400	145.1

03/27/00 18:52	548.8	12.66	0.10	0.263	83418	145.1
03/27/00 18:53	548.9	12.67	0.10	0.264	83400	145.2
03/27/00 18:54	549.3	12.66	0.10	0.264	83808	145.5
03/27/00 18:55	550.1	12.69	0.10	0.264	84054	145.7
03/27/00 18:56	550.6	12.69	0.10	0.263	84054	145.7
03/27/00 18:57	550.4	12.72	0.10	0.261	84168	146.0
03/27/00 18:58	549.6	12.78	0.10	0.261	84264	146.6
03/27/00 18:59	548.4	12.58	0.10	0.266	84246	146.5
03/27/00 19:00	548.0	12.51	0.10	0.267	84234	146.6
03/27/00 19:01	547.8	12.58	0.10	0.265	84246	146.6
03/27/00 19:02	547.9	12.63	0.10	0.264	84246	146.6
03/27/00 19:03	548.1	12.68	0.10	0.263	84252	146.5
03/27/00 19:04	548.4	12.68	0.10	0.263	84258	146.5
03/27/00 19:05	548.0	12.68	0.10	0.263	84330	146.7
03/27/00 19:06	547.9	12.63	0.10	0.264	84810	147.2
03/27/00 19:07	548.4	12.61	0.10	0.266	84846	147.1
03/27/00 19:08	548.6	12.58	0.10	0.268	84834	147.1
03/27/00 19:09	549.3	12.56	0.10	0.269	84612	147.1
03/27/00 19:10	550.2	12.66	0.10	0.269	84348	147.1
03/27/00 19:11	550.2	12.69	0.10	0.267	84318	147.0
03/27/00 19:12	550.0	12.67	0.10	0.268	84384	147.1
03/27/00 19:13	549.2	12.68	0.10	0.270	84744	146.9
03/27/00 19:14	549.0	12.61	0.10	0.270	84726	147.0
03/27/00 19:15	548.4	12.65	0.10	0.270	84750	147.0
03/27/00 19:16	548.4	12.66	0.10	0.271	84462	146.8
03/27/00 19:17	548.2	12.65	0.10	0.270	84294	146.7
03/27/00 19:18	547.3	12.65	0.10	0.270	84288	146.6
03/27/00 19:19	547.0	12.67	0.10	0.269	84234	146.7
03/27/00 19:20	546.8	12.65	0.10	0.268	84084	147.0
03/27/00 19:21	546.9	12.67	0.10	0.267	84084	147.0
03/27/00 19:22	546.3	12.66	0.10	0.265	84096	146.9
03/27/00 19:23	546.1	12.71	0.10	0.265	83790	147.1
03/27/00 19:24	546.0	12.70	0.10	0.265	83574	147.1
03/27/00 19:25	542.8	12.67	0.10	0.264	83568	147.1
03/27/00 19:26	538.7	12.65	0.10	0.263	83496	147.3
03/27/00 19:27	536.2	12.68	0.10	0.264	83430	147.4
03/27/00 19:28	535.3	12.66	0.10	0.263	83412	147.3
03/27/00 19:29	533.9	12.67	0.09	0.260	83436	147.4
03/27/00 19:30	533.3	12.69	0.09	0.256	82578	147.2
03/27/00 19:31	533.8	12.67	0.09	0.254	82236	147.3
03/27/00 19:32	533.8	12.63	0.09	0.251	82236	147.2
03/27/00 19:33	532.9	12.68	0.09	0.252	81966	147.4
03/27/00 19:34	532.6	12.67	0.10	0.256	81828	147.5
03/27/00 19:35	532.5	12.47	0.10	0.261	81798	147.4
03/27/00 19:36	532.6	12.47	0.09	0.260	81804	147.5
03/27/00 19:37	533.7	12.56	0.09	0.257	81570	147.5
03/27/00 19:38	535.8	12.69	0.09	0.254	81516	147.7
03/27/00 19:39	536.4	12.71	0.09	0.253	81498	147.6
03/27/00 19:40	536.0	12.71	0.09	0.253	82248	147.9
03/27/00 19:41	535.9	12.71	0.09	0.254	82356	148.1
03/27/00 19:42	534.9	12.66	0.09	0.255	82350	148.0
03/27/00 19:43	534.5	12.66	0.09	0.254	82266	148.1
03/27/00 19:44	533.9	12.64	0.09	0.253	81666	148.4
03/27/00 19:45	530.8	12.65	0.09	0.252	81630	148.4
03/27/00 19:46	528.3	12.66	0.09	0.252	81636	148.4
03/27/00 19:47	528.4	12.65	0.09	0.252	81204	148.6
03/27/00 19:48	528.0	12.69	0.09	0.251	81198	148.5
03/27/00 19:49	528.2	12.69	0.09	0.249	81186	148.5
03/27/00 19:50	527.9	12.67	0.09	0.246	81096	148.6
03/27/00 19:51	527.5	12.65	0.09	0.245	80982	148.5
03/27/00 19:52	526.3	12.65	0.09	0.243	80970	148.4
03/27/00 19:53	526.9	12.67	0.09	0.241	80838	148.6
03/27/00 19:54	527.8	12.66	0.09	0.239	80406	148.7
03/27/00 19:55	527.7	12.69	0.09	0.239	80364	148.8

03/27/00 19:56	527.5	12.69	0.09	0.237	80382	148.7
03/27/00 19:57	526.7	12.69	0.09	0.237	80418	148.8
03/27/00 19:58	525.4	12.71	0.09	0.237	80442	148.7
03/27/00 19:59	524.2	12.72	0.09	0.236	80424	148.7
03/27/00 20:00	523.4	12.70	0.09	0.234	80448	148.7
03/27/00 20:01	523.6	12.65	0.09	0.234	80418	148.7
03/27/00 20:02	524.6	12.67	0.09	0.233	80442	148.7
03/27/00 20:03	525.8	12.69	0.09	0.233	80424	148.8
03/27/00 20:04	526.8	12.67	0.09	0.232	80430	148.7
03/27/00 20:05	528.0	12.72	0.09	0.233	80640	148.9
03/27/00 20:06	528.2	12.74	0.09	0.234	80880	149.1
03/27/00 20:07	528.0	12.72	0.09	0.238	80868	149.2
03/27/00 20:08	527.3	12.63	0.09	0.240	80868	149.1
03/27/00 20:09	526.6	12.54	0.09	0.240	81588	149.5
03/27/00 20:10	525.9	12.59	0.09	0.239	81582	149.5
03/27/00 20:11	525.8	12.63	0.09	0.239	81576	149.6
03/27/00 20:12	525.8	12.63	0.09	0.238	81438	149.9
03/27/00 20:13	526.4	12.63	0.09	0.238	81300	149.9
03/27/00 20:14	526.8	12.62	0.09	0.238	81312	150.0
03/27/00 20:15	528.1	12.64	0.09	0.239	81270	150.0
03/27/00 20:16	527.4	12.64	0.09	0.240	80880	150.3
03/27/00 20:17	526.8	12.67	0.09	0.241	80898	150.2
03/27/00 20:18	526.6	12.64	0.09	0.243	80922	150.2
03/27/00 20:19	526.8	12.57	0.09	0.244	80766	150.3
03/27/00 20:20	525.7	12.62	0.09	0.242	80718	150.4
03/27/00 20:21	525.6	12.61	0.09	0.241	80718	150.3
03/27/00 20:22	525.7	12.60	0.09	0.242	80640	150.5
03/27/00 20:23	526.4	12.61	0.09	0.240	80484	150.7
03/27/00 20:24	532.1	12.83	0.09	0.237	80484	150.6
03/27/00 20:25	539.5	12.96	0.09	0.234	80478	150.6
03/27/00 20:26	538.6	12.93	0.10	0.235	80712	150.8
03/27/00 20:27	529.2	12.51	0.10	0.244	80772	150.9
03/27/00 20:28	521.5	12.48	0.10	0.244	80784	150.9
03/27/00 20:29	522.2	12.39	0.10	0.241	80754	151.1
03/27/00 20:30	522.3	12.50	0.10	0.233	80706	151.4
03/27/00 20:31	521.6	12.68	0.11	0.211	80700	151.4
03/27/00 20:32	519.7	12.69	0.12	0.197	80712	151.4
03/27/00 20:33	520.7	12.66	0.13	0.197	80898	151.7
03/27/00 20:34	522.1	12.63	0.13	0.204	81126	152.5
03/27/00 20:35	524.7	12.66	0.13	0.222	81120	152.6
03/27/00 20:36	525.3	12.67	0.12	0.234	81144	152.7
03/27/00 20:37	525.3	12.66	0.12	0.239	81084	153.3
03/27/00 20:38	525.3	12.64	0.12	0.243	81090	153.2
03/27/00 20:39	525.0	12.63	0.11	0.245	81084	153.2
03/27/00 20:40	524.9	12.63	0.11	0.248	80982	153.3
03/27/00 20:41	525.3	12.64	0.11	0.250	80736	153.8
03/27/00 20:42	525.1	12.65	0.11	0.252	80778	153.7
03/27/00 20:43	524.8	12.65	0.11	0.256	80694	153.7
03/27/00 20:44	524.9	12.67	0.11	0.260	80544	153.6
03/27/00 20:45	525.1	12.65	0.11	0.261	80538	153.5
03/27/00 20:46	524.9	12.66	0.11	0.261	80562	153.6
Final Average*	**539.6**	**12.55**	**0.10**	**0.254**	**83501**	**151.0**
Maximum*	**561.6**	**12.96**	**0.13**	**0.276**	**88488**	**159.3**
Minimum*	**519.7**	**12.04**	**0.08**	**0.197**	**78984**	**136.7**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 2

Enertec NTDAHS®
Average Values Report
04/10/00 08:59

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/28/00 08:37
Period End: 03/28/00 12:02
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit4Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxlbmbtu lb/MBT	Average StkFlwHrA kscfh	Average StkTemp degF
03/28/00 08:37	538.8	12.39	0.11	0.273	81336	152.2
03/28/00 08:38	538.3	12.41	0.11	0.274	81372	152.1
03/28/00 08:39	537.9	12.41	0.11	0.277	81312	152.2
03/28/00 08:40	538.6	12.38	0.10	0.276	81330	152.2
03/28/00 08:41	538.1	12.36	0.10	0.275	81336	152.2
03/28/00 08:42	538.2	12.40	0.10	0.276	81348	152.2
03/28/00 08:43	539.4	12.37	0.10	0.281	81174	152.5
03/28/00 08:44	540.9	12.38	0.10	0.282	81156	152.5
03/28/00 08:45	541.6	12.37	0.10	0.282	81174	152.5
03/28/00 08:46	541.6	12.39	0.10	0.282	81504	152.6
03/28/00 08:47	540.7	12.40	0.10	0.283	81570	152.6
03/28/00 08:48	540.0	12.40	0.10	0.284	81564	152.6
03/28/00 08:49	540.0	12.38	0.10	0.283	81708	152.7
03/28/00 08:50	540.8	12.41	0.10	0.285	81738	152.6
03/28/00 08:51	540.4	12.41	0.10	0.284	81732	152.7
03/28/00 08:52	538.5	12.41	0.10	0.283	81810	152.6
03/28/00 08:53	538.3	12.42	0.10	0.284	82170	152.3
03/28/00 08:54	538.7	12.41	0.10	0.286	82152	152.2
03/28/00 08:55	539.6	12.39	0.10	0.284	82152	152.3
03/28/00 08:56	540.1	12.38	0.10	0.285	81690	152.1
03/28/00 08:57	541.3	12.38	0.10	0.284	81618	152.0
03/28/00 08:58	541.2	12.37	0.10	0.285	81612	152.2
03/28/00 08:59	540.5	12.39	0.10	0.286	81606	152.2
03/28/00 09:00	539.6	12.37	0.10	0.286	81600	152.2
03/28/00 09:01	539.0	12.41	0.10	0.286	81636	152.2
03/28/00 09:02	538.8	12.40	0.10	0.286	81600	152.2
03/28/00 09:03	538.8	12.40	0.10	0.286	81600	152.1
03/28/00 09:04	540.0	12.39	0.10	0.287	81588	152.3
03/28/00 09:05	540.9	12.43	0.10	0.287	81582	152.2
03/28/00 09:06	541.3	12.38	0.10	0.287	81804	152.2
03/28/00 09:07	541.4	12.38	0.10	0.287	81834	152.1
03/28/00 09:08	540.6	12.37	0.10	0.287	81858	152.2
03/28/00 09:09	540.2	12.39	0.10	0.286	82152	152.5
03/28/00 09:10	538.6	12.38	0.10	0.287	82230	152.5
03/28/00 09:11	538.4	12.36	0.10	0.286	82206	152.5
03/28/00 09:12	538.3	12.39	0.10	0.285	82398	152.5
03/28/00 09:13	538.7	12.38	0.10	0.285	82806	152.4
03/28/00 09:14	539.5	12.40	0.10	0.284	82782	152.3
03/28/00 09:15	539.8	12.37	0.10	0.284	82800	152.4
03/28/00 09:16	540.3	12.39	0.10	0.284	82812	152.6
03/28/00 09:17	541.0	12.38	0.10	0.285	82842	152.7
03/28/00 09:18	540.2	12.38	0.10	0.284	82800	152.6
03/28/00 09:19	540.5	12.41	0.10	0.285	82740	152.5
03/28/00 09:20	539.5	12.41	0.10	0.285	82752	152.5
03/28/00 09:21	539.3	12.45	0.10	0.286	82740	152.5
03/28/00 09:22	538.8	12.41	0.10	0.286	82812	152.5
03/28/00 09:23	538.5	12.44	0.10	0.286	82884	152.6
03/28/00 09:24	538.8	12.45	0.10	0.287	82878	152.5

03/28/00	09:25	539.6	12.48	0.10	0.287	82884	152.5
03/28/00	09:26	540.7	12.46	0.10	0.287	82638	152.2
03/28/00	09:27	541.1	12.46	0.10	0.289	82704	152.2
03/28/00	09:28	541.0	12.50	0.10	0.288	82650	152.3
03/28/00	09:29	541.1	12.44	0.10	0.290	82422	152.1
03/28/00	09:30	540.7	12.48	0.10	0.290	82248	152.0
03/28/00	09:31	539.3	12.48	0.10	0.288	82284	152.0
03/28/00	09:32	538.8	12.46	0.10	0.286	82254	152.0
03/28/00	09:33	538.9	12.51	0.10	0.285	81426	151.8
03/28/00	09:34	538.5	12.46	0.10	0.284	81294	151.7
03/28/00	09:35	539.2	12.49	0.10	0.284	81294	151.7
03/28/00	09:36	540.5	12.46	0.10	0.285	81324	151.6
03/28/00	09:37	540.6	12.48	0.10	0.283	81324	151.6
03/28/00	09:38	540.3	12.50	0.10	0.283	81336	151.6
03/28/00	09:39	540.2	12.44	0.10	0.285	81336	151.5
03/28/00	09:40	540.2	12.43	0.10	0.285	81150	151.4
03/28/00	09:41	539.8	12.45	0.10	0.285	81168	151.4
03/28/00	09:42	538.3	12.42	0.10	0.283	81240	151.5
03/28/00	09:43	538.0	12.46	0.10	0.282	81636	151.7
03/28/00	09:44	538.8	12.46	0.10	0.281	81636	151.6
03/28/00	09:45	538.9	12.45	0.10	0.280	81630	151.8
03/28/00	09:46	538.7	12.41	0.10	0.279	81666	151.8
03/28/00	09:47	538.7	12.41	0.10	0.278	81672	151.9
03/28/00	09:48	538.1	12.43	0.10	0.279	81672	151.9
03/28/00	09:49	538.2	12.42	0.10	0.279	81732	151.9
03/28/00	09:50	538.3	12.42	0.10	0.279	82068	151.9
03/28/00	09:51	538.5	12.42	0.10	0.280	82074	151.9
03/28/00	09:52	538.4	12.42	0.10	0.282	82086	151.9
03/28/00	09:53	539.6	12.39	0.10	0.284	82290	151.9
03/28/00	09:54	541.7	12.39	0.10	0.283	82572	151.9
03/28/00	09:55	542.2	12.38	0.10	0.280	82536	151.9
03/28/00	09:56	541.6	12.40	0.10	0.277	82380	151.9
03/28/00	09:57	540.2	12.42	0.10	0.275	82020	151.7
03/28/00	09:58	539.2	12.38	0.10	0.274	82008	151.7
03/28/00	09:59	538.5	12.37	0.10	0.274	82014	151.7
03/28/00	10:00	538.0	12.36	0.10	0.273	82038	151.7
03/28/00	10:01	538.2	12.39	0.10	0.272	82008	151.7
03/28/00	10:02	539.3	12.41	0.10	0.273	81996	151.7
03/28/00	10:03	541.1	12.41	0.10	0.274	82002	151.6
03/28/00	10:04	541.7	12.41	0.10	0.274	82014	151.7
03/28/00	10:05	541.0	12.40	0.10	0.274	82098	151.7
03/28/00	10:06	540.7	12.48	0.10	0.274	82812	151.7
03/28/00	10:07	539.0	12.48	0.10	0.275	82824	151.7
03/28/00	10:08	537.9	12.46	0.10	0.274	82824	151.7
03/28/00	10:09	538.4	12.47	0.10	0.274	82524	151.6
03/28/00	10:10	538.8	12.49	0.10	0.274	82548	151.5
03/28/00	10:11	539.5	12.51	0.10	0.274	82530	151.6
03/28/00	10:12	540.3	12.47	0.10	0.274	82722	151.7
03/28/00	10:13	541.2	12.50	0.10	0.274	83238	151.7
03/28/00	10:14	541.6	12.51	0.10	0.274	83220	151.7
03/28/00	10:15	541.3	12.49	0.10	0.275	83250	151.9
03/28/00	10:16	540.9	12.49	0.10	0.274	82452	151.7
03/28/00	10:17	541.1	12.47	0.10	0.276	82344	151.8
03/28/00	10:18	540.6	12.49	0.10	0.276	82380	151.7
03/28/00	10:19	539.1	12.46	0.10	0.275	82236	151.7
03/28/00	10:20	538.4	12.50	0.10	0.275	82188	151.7
03/28/00	10:21	539.5	12.47	0.10	0.276	82182	151.6
03/28/00	10:22	540.0	12.49	0.10	0.276	82086	151.6
03/28/00	10:23	540.4	12.47	0.10	0.276	81786	151.5
03/28/00	10:24	540.3	12.46	0.10	0.278	81732	151.5
03/28/00	10:25	539.9	12.50	0.10	0.279	81702	151.5
03/28/00	10:26	540.1	12.46	0.10	0.280	81648	151.6
03/28/00	10:27	541.2	12.50	0.10	0.281	81666	151.6
03/28/00	10:28	540.7	12.45	0.10	0.280	81654	151.6

03/28/00 10:29	540.2	12.46	0.10	0.280	81762	151.7
03/28/00 10:30	539.5	12.43	0.10	0.282	81822	151.8
03/28/00 10:31	538.6	12.47	0.10	0.284	81846	151.7
03/28/00 10:32	538.6	12.43	0.10	0.284	81810	151.8
03/28/00 10:33	538.2	12.46	0.10	0.283	81810	151.7
03/28/00 10:34	538.3	12.42	0.10	0.281	81804	151.7
03/28/00 10:35	538.0	12.41	0.10	0.279	81822	151.7
03/28/00 10:36	538.2	12.40	0.10	0.279	81840	151.6
03/28/00 10:37	537.9	12.42	0.10	0.278	81858	151.6
03/28/00 10:38	537.5	12.43	0.10	0.277	81858	151.5
03/28/00 10:39	539.9	12.45	0.10	0.277	81918	151.6
03/28/00 10:40	540.9	12.41	0.10	0.277	82182	151.7
03/28/00 10:41	541.7	12.41	0.10	0.277	82194	151.7
03/28/00 10:42	541.5	12.41	0.10	0.278	82242	151.8
03/28/00 10:43	540.9	12.40	0.10	0.279	82362	151.9
03/28/00 10:44	541.2	12.43	0.10	0.279	82362	151.9
03/28/00 10:45	541.1	12.40	0.10	0.279	82356	151.9
03/28/00 10:46	541.5	12.44	0.10	0.277	82572	151.9
03/28/00 10:47	541.3	12.42	0.10	0.277	82596	151.9
03/28/00 10:48	540.8	12.39	0.11	0.276	82626	151.9
03/28/00 10:49	540.5	12.39	0.11	0.275	82536	151.9
03/28/00 10:50	540.1	12.38	0.11	0.276	82020	151.8
03/28/00 10:51	539.7	12.40	0.11	0.274	82026	151.8
03/28/00 10:52	539.4	12.43	0.11	0.274	82026	151.9
03/28/00 10:53	538.6	12.43	0.11	0.273	82014	151.9
03/28/00 10:54	538.3	12.46	0.11	0.272	82062	152.0
03/28/00 10:55	538.7	12.46	0.11	0.274	82068	152.0
03/28/00 10:56	538.9	12.42	0.11	0.276	82062	151.9
03/28/00 10:57	539.4	12.46	0.11	0.276	82080	152.2
03/28/00 10:58	540.5	12.48	0.11	0.277	82062	152.1
03/28/00 10:59	540.2	12.48	0.11	0.278	82056	152.2
03/28/00 11:00	540.3	12.47	0.11	0.279	82074	152.2
03/28/00 11:01	540.4	12.46	0.11	0.281	82068	152.2
03/28/00 11:02	540.7	12.44	0.11	0.280	82092	152.2
03/28/00 11:03	541.0	12.49	0.11	0.278	82056	152.2
03/28/00 11:04	541.4	12.45	0.11	0.278	82068	152.2
03/28/00 11:05	541.0	12.46	0.11	0.279	82080	152.2
03/28/00 11:06	539.7	12.46	0.11	0.280	81960	152.1
03/28/00 11:07	538.7	12.47	0.11	0.283	81846	152.2
03/28/00 11:08	538.9	12.45	0.11	0.283	81834	152.2
03/28/00 11:09	540.0	12.44	0.11	0.281	81684	152.1
03/28/00 11:10	541.1	12.41	0.11	0.279	81360	152.0
03/28/00 11:11	541.0	12.43	0.11	0.277	81342	152.0
03/28/00 11:12	540.1	12.44	0.11	0.277	81324	152.0
03/28/00 11:13	539.2	12.44	0.11	0.279	81396	152.0
03/28/00 11:14	538.5	12.47	0.11	0.282	81444	152.0
03/28/00 11:15	538.7	12.45	0.11	0.283	81426	152.0
03/28/00 11:16	539.7	12.40	0.11	0.286	81732	152.0
03/28/00 11:17	539.7	12.44	0.11	0.285	81942	152.0
03/28/00 11:18	538.7	12.43	0.11	0.284	81918	152.0
03/28/00 11:19	538.8	12.43	0.11	0.287	81930	152.0
03/28/00 11:20	538.8	12.43	0.11	0.288	82116	152.2
03/28/00 11:21	539.0	12.40	0.11	0.286	82284	152.2
03/28/00 11:22	539.4	12.40	0.11	0.283	82284	152.2
03/28/00 11:23	539.4	12.40	0.10	0.283	82272	152.2
03/28/00 11:24	539.4	12.41	0.10	0.282	82350	152.0
03/28/00 11:25	538.6	12.41	0.11	0.282	82320	151.9
03/28/00 11:26	538.0	12.42	0.11	0.281	82332	151.8
03/28/00 11:27	538.1	12.42	0.11	0.281	82218	151.9
03/28/00 11:28	538.4	12.39	0.11	0.280	82080	151.8
03/28/00 11:29	538.6	12.39	0.11	0.277	82050	151.9
03/28/00 11:30	539.4	12.44	0.11	0.277	82200	151.9
03/28/00 11:31	539.6	12.46	0.11	0.277	82440	152.0
03/28/00 11:32	540.4	12.45	0.11	0.277	82464	151.9

03/28/00 11:33	541.1	12.46	0.11	0.277	82482	152.0
03/28/00 11:34	541.3	12.50	0.11	0.277	82284	152.3
03/28/00 11:35	541.0	12.50	0.11	0.278	82182	152.3
03/28/00 11:36	540.8	12.49	0.11	0.277	82194	152.4
03/28/00 11:37	540.4	12.50	0.11	0.277	82014	152.4
03/28/00 11:38	540.0	12.52	0.11	0.278	81870	152.5
03/28/00 11:39	540.4	12.49	0.11	0.279	81870	152.6
03/28/00 11:40	539.8	12.48	0.11	0.277	81858	152.5
03/28/00 11:41	539.3	12.47	0.11	0.276	81654	152.5
03/28/00 11:42	539.3	12.48	0.11	0.277	81588	152.5
03/28/00 11:43	540.2	12.49	0.11	0.279	81582	152.5
03/28/00 11:44	540.9	12.51	0.11	0.281	81618	152.6
03/28/00 11:45	541.0	12.48	0.11	0.282	81726	152.5
03/28/00 11:46	540.7	12.51	0.11	0.282	81744	152.6
03/28/00 11:47	541.0	12.49	0.11	0.281	81996	152.5
03/28/00 11:48	540.4	12.48	0.11	0.279	82584	152.5
03/28/00 11:49	538.8	12.49	0.11	0.277	82578	152.5
03/28/00 11:50	538.2	12.46	0.11	0.279	82524	152.4
03/28/00 11:51	538.5	12.45	0.11	0.281	82266	152.4
03/28/00 11:52	539.2	12.46	0.10	0.280	82266	152.4
03/28/00 11:53	541.2	12.48	0.10	0.280	82260	152.4
03/28/00 11:54	541.5	12.46	0.11	0.280	82314	152.4
03/28/00 11:55	540.5	12.45	0.11	0.279	82362	152.5
03/28/00 11:56	539.9	12.48	0.11	0.282	82362	152.5
03/28/00 11:57	538.8	12.47	0.11	0.283	82134	152.5
03/28/00 11:58	538.8	12.41	0.11	0.285	81858	152.5
03/28/00 11:59	538.6	12.42	0.10	0.286	81834	152.5
03/28/00 12:00	539.4	12.41	0.11	0.285	81828	152.5
03/28/00 12:01	539.9	12.44	0.11	0.285	81822	152.5
Final Average*	**539.7**	**12.43**	**0.10**	**0.280**	**82032**	**152.1**
Maximum*	**542.2**	**12.52**	**0.11**	**0.290**	**83250**	**152.7**
Minimum*	**537.5**	**12.36**	**0.10**	**0.272**	**81150**	**151.4**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 3

Enertec NTDAHS®
Average Values Report
04/10/00 09:00

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/28/00 13:25
Period End: 03/28/00 16:58
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average Unit4Load mwt	Average CO2Corr %	Average SO2lbmbtu lb/MBT	Average NOxlbmbtu lb/MBT	Average StkFlwHrA kscfh	Average StkTemp degF
03/28/00 13:25	541.0	12.49	0.11	0.259	80958	153.2
03/28/00 13:26	540.8	12.50	0.11	0.256	80952	153.2
03/28/00 13:27	540.6	12.50	0.11	0.254	80886	153.2
03/28/00 13:28	539.8	12.49	0.11	0.253	80856	153.2
03/28/00 13:29	538.1	12.46	0.11	0.252	80886	153.2
03/28/00 13:30	537.9	12.46	0.11	0.254	81384	153.4
03/28/00 13:31	538.1	12.51	0.11	0.254	81756	153.4
03/28/00 13:32	538.8	12.53	0.11	0.252	81744	153.4
03/28/00 13:33	539.5	12.49	0.11	0.253	81834	153.4
03/28/00 13:34	540.1	12.46	0.11	0.253	82212	153.8
03/28/00 13:35	540.8	12.43	0.11	0.254	82200	153.9
03/28/00 13:36	541.3	12.43	0.11	0.256	82188	153.9
03/28/00 13:37	540.5	12.47	0.11	0.257	82206	153.9
03/28/00 13:38	540.3	12.49	0.11	0.257	82224	153.8
03/28/00 13:39	540.3	12.49	0.11	0.257	82206	153.8
03/28/00 13:40	539.8	12.44	0.11	0.257	81654	153.8
03/28/00 13:41	540.6	12.43	0.11	0.259	81246	153.8
03/28/00 13:42	541.7	12.46	0.11	0.260	81252	153.7
03/28/00 13:43	541.0	12.47	0.11	0.259	81246	153.7
03/28/00 13:44	540.9	12.46	0.11	0.259	81174	153.5
03/28/00 13:45	540.7	12.45	0.11	0.260	81144	153.6
03/28/00 13:46	540.8	12.44	0.11	0.261	81138	153.6
03/28/00 13:47	540.8	12.41	0.11	0.260	81240	153.6
03/28/00 13:48	541.0	12.45	0.11	0.259	81294	153.5
03/28/00 13:49	540.4	12.44	0.11	0.260	81306	153.5
03/28/00 13:50	539.6	12.44	0.11	0.259	81324	153.5
03/28/00 13:51	540.0	12.44	0.11	0.260	81288	153.5
03/28/00 13:52	539.5	12.42	0.11	0.262	81312	153.5
03/28/00 13:53	539.0	12.39	0.11	0.262	81288	153.5
03/28/00 13:54	539.5	12.40	0.11	0.263	80886	153.6
03/28/00 13:55	540.0	12.43	0.11	0.264	80718	153.4
03/28/00 13:56	540.4	12.43	0.11	0.264	80700	153.5
03/28/00 13:57	540.9	12.48	0.11	0.264	80982	153.5
03/28/00 13:58	541.0	12.45	0.11	0.264	81330	153.8
03/28/00 13:59	540.0	12.45	0.11	0.265	81342	153.8
03/28/00 14:00	540.4	12.44	0.11	0.266	81336	153.9
03/28/00 14:01	540.9	12.52	0.11	0.265	81348	153.8
03/28/00 14:02	540.8	12.52	0.11	0.263	81336	153.9
03/28/00 14:03	540.3	12.50	0.11	0.262	81342	153.8
03/28/00 14:04	541.2	12.45	0.11	0.262	81348	153.8
03/28/00 14:05	541.0	12.48	0.11	0.262	81348	153.9
03/28/00 14:06	540.7	12.48	0.11	0.262	81576	154.0
03/28/00 14:07	540.2	12.50	0.11	0.263	81594	154.0
03/28/00 14:08	539.8	12.52	0.11	0.263	81588	153.9
03/28/00 14:09	539.8	12.49	0.11	0.263	81786	153.9
03/28/00 14:10	539.1	12.48	0.11	0.261	81924	153.9
03/28/00 14:11	538.6	12.44	0.11	0.263	81936	153.9
03/28/00 14:12	538.6	12.42	0.11	0.265	81912	153.8

03/28/00 14:13	539.7	12.45	0.11	0.265	81762	153.8
03/28/00 14:14	539.4	12.48	0.11	0.265	81738	153.8
03/28/00 14:15	539.3	12.47	0.11	0.264	81744	153.8
03/28/00 14:16	538.4	12.42	0.11	0.264	81894	153.8
03/28/00 14:17	538.4	12.42	0.11	0.264	81918	153.9
03/28/00 14:18	538.7	12.44	0.11	0.265	81882	153.8
03/28/00 14:19	538.3	12.45	0.11	0.265	81738	153.8
03/28/00 14:20	538.0	12.45	0.11	0.264	81606	153.8
03/28/00 14:21	538.4	12.45	0.11	0.264	81588	153.9
03/28/00 14:22	539.1	12.42	0.11	0.265	81600	153.8
03/28/00 14:23	539.7	12.41	0.11	0.265	81516	153.8
03/28/00 14:24	540.2	12.41	0.11	0.264	81528	153.8
03/28/00 14:25	541.4	12.47	0.11	0.264	81450	153.8
03/28/00 14:26	541.1	12.45	0.11	0.263	81456	153.8
03/28/00 14:27	540.5	12.48	0.11	0.262	81390	153.7
03/28/00 14:28	539.9	12.49	0.11	0.261	81438	153.7
03/28/00 14:29	539.6	12.45	0.10	0.259	81408	153.7
03/28/00 14:30	539.7	12.47	0.11	0.257	80994	153.9
03/28/00 14:31	539.6	12.49	0.11	0.251	81024	153.8
03/28/00 14:32	539.0	12.49	0.11	0.248	81024	153.9
03/28/00 14:33	538.5	12.50	0.11	0.250	81024	153.9
03/28/00 14:34	538.5	12.52	0.11	0.249	80988	154.1
03/28/00 14:35	538.6	12.48	0.11	0.248	80976	154.2
03/28/00 14:36	539.4	12.47	0.11	0.247	81006	154.3
03/28/00 14:37	539.8	12.49	0.11	0.247	81270	154.7
03/28/00 14:38	540.8	12.53	0.11	0.247	81282	154.7
03/28/00 14:39	540.5	12.52	0.11	0.251	81288	154.5
03/28/00 14:40	539.7	12.43	0.11	0.251	81852	154.9
03/28/00 14:41	539.5	12.42	0.11	0.252	82200	155.1
03/28/00 14:42	538.8	12.44	0.11	0.252	82194	155.1
03/28/00 14:43	538.7	12.44	0.11	0.252	82326	155.1
03/28/00 14:44	538.6	12.46	0.11	0.254	82512	155.2
03/28/00 14:45	538.6	12.48	0.11	0.252	82494	155.2
03/28/00 14:46	538.9	12.46	0.11	0.250	82488	155.3
03/28/00 14:47	539.8	12.42	0.11	0.249	82464	155.4
03/28/00 14:48	540.6	12.42	0.11	0.250	82404	155.5
03/28/00 14:49	540.2	12.44	0.11	0.250	82434	155.6
03/28/00 14:50	540.5	12.43	0.11	0.250	82272	155.8
03/28/00 14:51	540.8	12.46	0.11	0.250	82224	156.0
03/28/00 14:52	541.1	12.41	0.11	0.250	82224	156.0
03/28/00 14:53	541.1	12.39	0.10	0.250	82194	156.0
03/28/00 14:54	540.7	12.45	0.10	0.250	81678	156.2
03/28/00 14:55	540.5	12.45	0.10	0.252	81720	156.3
03/28/00 14:56	540.4	12.52	0.10	0.253	81702	156.3
03/28/00 14:57	541.3	12.47	0.10	0.253	82080	156.4
03/28/00 14:58	541.0	12.51	0.10	0.253	82116	156.3
03/28/00 14:59	541.4	12.49	0.10	0.252	82116	156.3
03/28/00 15:00	541.1	12.49	0.10	0.252	82116	156.3
03/28/00 15:01	540.7	12.53	0.10	0.252	82128	156.4
03/28/00 15:02	540.7	12.52	0.10	0.251	82098	156.3
03/28/00 15:03	540.8	12.51	0.10	0.251	82104	156.4
03/28/00 15:04	540.1	12.49	0.10	0.251	82092	156.3
03/28/00 15:05	539.9	12.45	0.10	0.249	82026	156.1
03/28/00 15:06	539.0	12.47	0.10	0.247	81894	155.7
03/28/00 15:07	539.0	12.47	0.10	0.245	81906	155.7
03/28/00 15:08	538.3	12.51	0.10	0.245	81888	155.7
03/28/00 15:09	538.3	12.50	0.10	0.245	82158	155.3
03/28/00 15:10	538.0	12.48	0.10	0.245	82260	155.0
03/28/00 15:11	538.0	12.44	0.10	0.244	82254	155.0
03/28/00 15:12	538.2	12.45	0.10	0.241	81756	154.7
03/28/00 15:13	538.0	12.46	0.10	0.241	81444	154.3
03/28/00 15:14	539.3	12.50	0.10	0.242	81426	154.3
03/28/00 15:15	539.2	12.47	0.10	0.243	81420	154.3
03/28/00 15:16	538.8	12.47	0.10	0.243	81402	154.3

03/28/00 16:21	540.7	12.50	0.10	0.251	82500	155.0
03/28/00 16:22	541.2	12.47	0.10	0.251	82416	154.9
03/28/00 16:23	540.9	12.45	0.10	0.251	82416	155.0
03/28/00 16:24	541.0	12.47	0.10	0.252	82404	154.9
03/28/00 16:25	541.2	12.52	0.10	0.253	82404	154.9
03/28/00 16:26	541.3	12.53	0.10	0.253	82308	154.7
03/28/00 16:27	540.6	12.56	0.10	0.253	82230	154.5
03/28/00 16:28	539.5	12.48	0.10	0.253	82260	154.8
03/28/00 16:29	539.0	12.46	0.10	0.254	82260	154.6
03/28/00 16:30	538.5	12.43	0.10	0.254	81588	154.3
03/28/00 16:31	538.7	12.53	0.10	0.254	81582	154.2
03/28/00 16:32	538.7	12.51	0.10	0.254	81588	154.4
03/28/00 16:33	538.7	12.47	0.10	0.254	81750	154.3
03/28/00 16:34	538.8	12.46	0.10	0.254	81756	154.4
03/28/00 16:35	538.4	12.44	0.10	0.253	81738	154.2
03/28/00 16:36	538.3	12.41	0.10	0.254	81804	154.5
03/28/00 16:37	539.2	12.45	0.10	0.255	81810	154.4
03/28/00 16:38	540.1	12.47	0.10	0.254	81822	154.4
03/28/00 16:39	540.7	12.48	0.10	0.253	81816	154.4
03/28/00 16:40	541.0	12.47	0.10	0.254	82110	154.5
03/28/00 16:41	541.2	12.41	0.10	0.255	82356	154.4
03/28/00 16:42	540.9	12.41	0.10	0.256	82320	154.5
03/28/00 16:43	540.5	12.45	0.10	0.257	82224	154.5
03/28/00 16:44	540.9	12.49	0.10	0.258	82026	154.5
03/28/00 16:45	540.9	12.44	0.10	0.256	82050	154.6
03/28/00 16:46	540.5	12.43	0.10	0.256	82152	154.4
03/28/00 16:47	540.4	12.40	0.10	0.257	82776	154.9
03/28/00 16:48	539.7	12.42	0.10	0.257	82806	155.0
03/28/00 16:49	538.6	12.45	0.10	0.257	82770	155.0
03/28/00 16:50	538.1	12.49	0.10	0.254	82782	155.2
03/28/00 16:51	538.3	12.49	0.10	0.253	82794	155.4
03/28/00 16:52	538.2	12.48	0.10	0.257	82758	155.3
03/28/00 16:53	538.8	12.47	0.10	0.258	82782	155.4
03/28/00 16:54	539.6	12.44	0.10	0.259	82878	155.5
03/28/00 16:55	540.2	12.54	0.10	0.258	82860	155.6
03/28/00 16:56	540.7	12.55	0.10	0.257	82824	155.6
03/28/00 16:57	540.9	12.54	0.10	0.259	82728	155.4
Final Average*	**539.8**	**12.46**	**0.10**	**0.252**	**81841**	**154.8**
Maximum*	**541.7**	**12.56**	**0.11**	**0.266**	**82878**	**157.1**
Minimum*	**537.9**	**12.39**	**0.10**	**0.238**	**80700**	**153.2**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 1
Scrubber

Enertec NTDAHS®
Average Values Report
04/10/00 09:04

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/27/00 17:00
Period End: 03/27/00 20:47
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average AVentDiff in wg	Average BVentDiff in wg	Average CVentDiff in wg	Average DVentDiff in wg	Average Opacity %
03/27/00 17:00	12.3	0.0	13.4	13.0	18.3
03/27/00 17:01	12.3	0.0	13.5	12.9	19.1
03/27/00 17:02	12.3	0.0	13.6	13.1	20.8
03/27/00 17:03	12.6	0.0	14.0	13.4	21.9
03/27/00 17:04	12.9	0.0	14.2	13.6	21.4
03/27/00 17:05	13.2	0.0	14.3	13.7	20.9
03/27/00 17:06	13.3	0.0	14.3	13.7	20.3
03/27/00 17:07	13.4	0.0	14.4	13.8	20.1
03/27/00 17:08	13.5	0.0	14.5	14.1	20.0
03/27/00 17:09	13.6	0.0	14.8	14.4	19.5
03/27/00 17:10	13.8	0.0	15.0	14.5	19.5
03/27/00 17:11	13.9	0.0	15.1	14.6	19.1
03/27/00 17:12	13.9	0.0	15.1	14.6	19.8
03/27/00 17:13	13.9	0.0	15.0	14.3	17.8
03/27/00 17:14	13.7	0.0	14.6	13.9	16.4
03/27/00 17:15	13.5	0.0	14.3	13.7	16.4
03/27/00 17:16	13.4	0.0	14.3	13.7	17.1
03/27/00 17:17	13.1	0.0	14.3	13.7	16.8
03/27/00 17:18	13.1	0.0	14.1	13.5	17.1
03/27/00 17:19	13.0	0.0	14.0	13.5	17.5
03/27/00 17:20	12.9	0.0	13.9	13.5	17.1
03/27/00 17:21	12.8	0.0	13.9	13.4	17.4
03/27/00 17:22	12.7	0.0	13.8	13.1	17.4
03/27/00 17:23	12.6	0.0	13.8	13.2	18.0
03/27/00 17:24	12.7	0.0	13.8	13.3	17.6
03/27/00 17:25	12.6	0.0	13.8	13.2	18.0
03/27/00 17:26	12.6	0.0	13.8	13.2	17.9
03/27/00 17:27	12.5	0.0	13.7	13.2	18.1
03/27/00 17:28	12.6	0.0	13.7	13.2	17.9
03/27/00 17:29	12.6	0.0	13.7	13.2	18.2
03/27/00 17:30	12.6	0.0	13.8	13.2	18.0
03/27/00 17:31	12.5	0.0	13.7	13.1	17.9
03/27/00 17:32	12.5	0.0	13.5	12.9	17.8
03/27/00 17:33	12.5	0.0	13.4	12.8	18.2
03/27/00 17:34	12.3	0.0	13.4	12.9	18.4
03/27/00 17:35	12.4	0.0	13.6	13.0	18.4
03/27/00 17:36	12.5	0.0	13.6	13.0	18.3
03/27/00 17:37	12.4	0.0	13.5	13.1	18.4
03/27/00 17:38	12.4	0.0	13.4	12.9	18.2
03/27/00 17:39	12.3	0.0	13.4	12.8	18.3
03/27/00 17:40	12.3	0.0	13.5	13.0	18.6
03/27/00 17:41	12.4	0.0	13.7	13.0	18.5
03/27/00 17:42	12.4	0.0	13.6	13.0	18.1
03/27/00 17:43	12.3	0.0	13.6	12.9	18.3
03/27/00 17:44	12.3	0.0	13.5	12.9	18.5
03/27/00 17:45	12.3	0.0	13.5	12.8	18.3
03/27/00 17:46	12.2	0.0	13.3	12.8	18.4
03/27/00 17:47	12.2	0.0	13.4	12.9	18.7

03/27/00 17:48	12.3	0.0	13.5	13.0	18.5
03/27/00 17:49	12.4	0.0	13.6	13.1	19.2
03/27/00 17:50	12.4	0.0	13.6	13.0	18.2
03/27/00 17:51	12.4	0.0	13.5	12.8	18.2
03/27/00 17:52	12.5	0.0	13.4	12.8	18.5
03/27/00 17:53	12.3	0.0	13.2	12.6	18.4
03/27/00 17:54	12.1	0.0	13.0	12.4	18.5
03/27/00 17:55	12.1	0.0	13.0	12.4	18.6
03/27/00 17:56	12.1	0.0	13.0	12.5	18.5
03/27/00 17:57	11.9	0.0	13.0	12.5	18.3
03/27/00 17:58	11.9	0.0	13.0	12.5	18.3
03/27/00 17:59	12.0	0.0	13.1	12.6	18.3
03/27/00 18:00	12.0	0.0	13.1	12.6	18.5
03/27/00 18:01	12.0	0.0	13.1	12.6	18.2
03/27/00 18:02	12.0	0.0	13.1	12.6	18.5
03/27/00 18:03	12.0	0.0	13.1	12.5	18.3
03/27/00 18:04	11.9	0.0	13.1	12.4	18.5
03/27/00 18:05	11.9	0.0	12.9	12.3	18.7
03/27/00 18:06	11.9	0.0	12.9	12.3	19.0
03/27/00 18:07	11.9	0.0	13.0	12.4	18.6
03/27/00 18:08	11.9	0.0	12.9	12.4	18.4
03/27/00 18:09	11.8	0.0	12.9	12.4	18.3
03/27/00 18:10	11.9	0.0	13.0	12.5	20.1
03/27/00 18:11	12.2	0.0	13.3	12.7	18.2
03/27/00 18:12	11.5	5.2	12.0	11.5	19.0
03/27/00 18:13	10.9	13.0	12.1	11.7	23.5
03/27/00 18:14	11.4	13.5	12.4	12.0	22.2
03/27/00 18:15	11.4	12.3	12.3	11.8	21.4
03/27/00 18:16	11.7	12.3	12.9	12.5	22.2
03/27/00 18:17	12.3	12.8	13.4	13.0	21.2
03/27/00 18:18	12.6	12.9	13.6	13.2	20.2
03/27/00 18:19	12.7	12.9	13.5	13.2	20.0
03/27/00 18:20	12.7	12.9	13.7	13.3	20.0
03/27/00 18:21	12.8	13.1	13.7	13.4	19.7
03/27/00 18:22	12.9	13.2	13.8	13.5	19.5
03/27/00 18:23	12.9	13.2	13.8	13.4	19.0
03/27/00 18:24	12.9	13.0	13.8	13.3	18.6
03/27/00 18:25	12.8	13.1	13.8	13.3	18.4
03/27/00 18:26	12.8	13.0	13.7	13.3	18.4
03/27/00 18:27	12.8	13.1	13.7	13.4	18.3
03/27/00 18:28	12.9	13.1	13.8	13.5	18.4
03/27/00 18:29	13.0	13.2	13.9	13.6	18.5
03/27/00 18:30	13.1	13.3	14.0	13.7	18.4
03/27/00 18:31	13.1	13.4	14.1	13.7	18.6
03/27/00 18:32	13.1	13.4	14.1	13.7	18.7
03/27/00 18:33	13.1	13.3	14.1	13.6	18.4
03/27/00 18:34	13.2	13.4	14.2	13.7	18.6
03/27/00 18:35	13.1	13.3	14.1	13.6	18.3
03/27/00 18:36	13.0	13.4	14.0	13.6	18.9
03/27/00 18:37	13.1	13.4	14.1	13.6	18.0
03/27/00 18:38	13.1	13.4	14.0	13.7	18.2
03/27/00 18:39	13.1	13.4	14.1	13.7	19.4
03/27/00 18:40	13.3	13.6	14.3	13.9	19.0
03/27/00 18:41	13.3	13.6	14.2	13.8	18.1
03/27/00 18:42	13.2	13.4	14.1	13.7	18.1
03/27/00 18:43	13.1	13.4	14.2	13.7	18.2
03/27/00 18:44	13.1	13.3	14.1	13.6	18.0
03/27/00 18:45	13.0	13.3	14.0	13.6	18.3
03/27/00 18:46	13.0	13.4	14.1	13.6	18.1
03/27/00 18:47	13.0	13.3	14.0	13.5	18.0
03/27/00 18:48	13.0	13.3	14.0	13.6	18.2
03/27/00 18:49	13.0	13.2	13.9	13.5	18.4
03/27/00 18:50	13.0	13.2	13.8	13.5	18.3
03/27/00 18:51	12.9	13.2	13.9	13.5	18.0

03/27/00 18:52	12.8	13.1	13.9	13.4	18.2
03/27/00 18:53	12.8	13.2	13.9	13.4	18.6
03/27/00 18:54	12.9	13.2	13.9	13.5	18.4
03/27/00 18:55	12.9	13.3	14.0	13.5	18.8
03/27/00 18:56	13.0	13.2	13.9	13.5	18.5
03/27/00 18:57	12.9	13.2	13.8	13.4	17.9
03/27/00 18:58	12.8	13.1	13.8	13.3	18.3
03/27/00 18:59	12.8	13.1	13.9	13.4	18.2
03/27/00 19:00	12.8	13.1	13.8	13.3	18.2
03/27/00 19:01	12.8	13.1	13.7	13.4	18.4
03/27/00 19:02	12.9	13.2	13.8	13.5	18.8
03/27/00 19:03	12.9	13.3	13.9	13.5	18.5
03/27/00 19:04	12.9	13.1	13.9	13.5	18.5
03/27/00 19:05	12.8	13.2	13.9	13.5	18.7
03/27/00 19:06	12.9	13.2	14.0	13.5	18.1
03/27/00 19:07	12.8	13.2	14.0	13.4	18.4
03/27/00 19:08	12.8	13.2	13.9	13.4	18.5
03/27/00 19:09	12.9	13.2	13.9	13.5	18.4
03/27/00 19:10	12.9	13.2	13.9	13.4	18.2
03/27/00 19:11	12.8	13.1	13.8	13.4	18.1
03/27/00 19:12	12.7	13.0	13.8	13.3	18.3
03/27/00 19:13	12.7	13.0	13.8	13.3	18.4
03/27/00 19:14	12.8	13.1	13.8	13.4	18.7
03/27/00 19:15	12.8	13.0	13.7	13.4	18.6
03/27/00 19:16	12.8	13.1	13.8	13.4	19.1
03/27/00 19:17	12.8	13.1	13.9	13.3	18.3
03/27/00 19:18	12.8	13.1	13.8	13.4	18.5
03/27/00 19:19	12.8	13.1	13.8	13.4	18.7
03/27/00 19:20	12.9	13.2	13.9	13.5	18.4
03/27/00 19:21	12.9	13.1	13.8	13.4	18.4
03/27/00 19:22	12.9	13.1	13.8	13.3	18.4
03/27/00 19:23	12.8	13.1	13.8	13.3	18.2
03/27/00 19:24	12.8	13.1	13.8	13.3	18.3
03/27/00 19:25	12.7	13.0	13.7	13.2	18.4
03/27/00 19:26	12.6	12.9	13.5	13.0	18.2
03/27/00 19:27	12.5	12.8	13.5	13.0	18.4
03/27/00 19:28	12.5	12.7	13.3	13.0	18.4
03/27/00 19:29	12.5	12.8	13.4	13.1	18.4
03/27/00 19:30	12.6	12.9	13.5	13.1	18.3
03/27/00 19:31	12.7	12.9	13.5	13.3	18.7
03/27/00 19:32	12.7	13.1	13.6	13.2	18.5
03/27/00 19:33	12.6	12.8	13.5	13.0	17.9
03/27/00 19:34	12.5	12.7	13.5	13.0	18.4
03/27/00 19:35	12.5	12.8	13.5	13.1	18.5
03/27/00 19:36	12.7	12.9	13.6	13.2	18.6
03/27/00 19:37	12.7	12.9	13.6	13.2	18.8
03/27/00 19:38	12.7	12.9	13.6	13.2	18.5
03/27/00 19:39	12.6	12.9	13.5	13.1	18.7
03/27/00 19:40	12.6	12.8	13.6	13.1	18.4
03/27/00 19:41	12.6	12.8	13.5	13.0	18.4
03/27/00 19:42	12.6	12.8	13.5	13.0	18.5
03/27/00 19:43	12.6	12.9	13.6	13.2	18.9
03/27/00 19:44	12.7	12.9	13.6	13.2	18.6
03/27/00 19:45	12.7	12.9	13.6	13.1	18.8
03/27/00 19:46	12.6	12.9	13.6	13.0	18.6
03/27/00 19:47	12.6	12.9	13.5	13.0	18.7
03/27/00 19:48	12.6	12.9	13.6	13.1	18.8
03/27/00 19:49	12.6	12.9	13.6	13.1	18.6
03/27/00 19:50	12.7	12.9	13.6	13.1	18.4
03/27/00 19:51	12.6	12.9	13.5	13.1	18.5
03/27/00 19:52	12.6	12.9	13.4	13.1	18.4
03/27/00 19:53	12.7	13.0	13.4	13.2	18.7
03/27/00 19:54	12.7	13.0	13.5	13.2	19.0
03/27/00 19:55	12.7	12.9	13.5	13.1	18.4

03/27/00 19:56	12.6	12.8	13.5	13.0	18.4
03/27/00 19:57	12.6	12.9	13.5	13.0	18.9
03/27/00 19:58	12.6	12.8	13.6	13.1	18.5
03/27/00 19:59	12.6	12.8	13.6	13.0	18.2
03/27/00 20:00	12.6	12.8	13.5	13.1	18.5
03/27/00 20:01	12.7	13.0	13.6	13.2	18.8
03/27/00 20:02	12.8	13.1	13.7	13.2	18.7
03/27/00 20:03	12.8	13.1	13.7	13.3	18.8
03/27/00 20:04	12.9	13.1	13.7	13.4	18.7
03/27/00 20:05	12.8	13.1	13.7	13.3	18.3
03/27/00 20:06	12.8	13.0	13.7	13.1	18.3
03/27/00 20:07	12.7	12.9	13.6	13.1	18.5
03/27/00 20:08	12.7	12.9	13.5	13.1	18.3
03/27/00 20:09	12.7	12.9	13.5	13.2	18.8
03/27/00 20:10	12.8	13.0	13.6	13.2	18.5
03/27/00 20:11	12.9	13.1	13.6	13.3	18.7
03/27/00 20:12	12.9	13.0	13.6	13.3	18.2
03/27/00 20:13	12.8	13.0	13.6	13.2	18.3
03/27/00 20:14	12.8	13.0	13.7	13.3	18.7
03/27/00 20:15	12.9	13.1	13.7	13.4	18.8
03/27/00 20:16	12.8	13.0	13.7	13.2	18.4
03/27/00 20:17	12.7	12.9	13.6	13.1	18.4
03/27/00 20:18	12.7	12.9	13.5	13.1	18.9
03/27/00 20:19	12.8	13.0	13.7	13.3	18.5
03/27/00 20:20	12.8	13.1	13.6	13.3	18.5
03/27/00 20:21	12.8	13.0	13.6	13.2	18.4
03/27/00 20:22	12.9	13.2	13.7	13.4	18.6
03/27/00 20:23	13.1	13.4	14.0	13.7	20.0
03/27/00 20:24	13.5	14.0	14.6	14.3	21.4
03/27/00 20:25	13.4	13.4	14.2	13.7	17.8
03/27/00 20:26	13.0	13.1	13.8	13.3	17.7
03/27/00 20:27	13.0	13.3	14.0	13.5	17.5
03/27/00 20:28	12.9	13.0	13.7	13.2	18.4
03/27/00 20:29	13.2	13.5	14.1	13.8	20.1
03/27/00 20:30	13.5	13.8	14.4	14.0	19.3
03/27/00 20:31	13.6	13.8	14.3	14.0	19.5
03/27/00 20:32	13.6	13.8	14.4	14.0	18.3
03/27/00 20:33	13.5	13.6	14.3	13.8	18.4
03/27/00 20:34	13.3	13.5	14.3	13.7	18.3
03/27/00 20:35	13.3	13.6	14.3	13.7	18.7
03/27/00 20:36	13.3	13.5	14.3	13.8	18.5
03/27/00 20:37	13.3	13.5	14.1	13.7	18.0
03/27/00 20:38	13.2	13.4	14.1	13.6	18.1
03/27/00 20:39	13.2	13.4	14.1	13.6	18.2
03/27/00 20:40	13.2	13.3	14.0	13.6	18.4
03/27/00 20:41	13.2	13.3	13.9	13.5	18.1
03/27/00 20:42	13.1	13.2	13.9	13.5	18.0
03/27/00 20:43	13.1	13.3	13.9	13.5	18.6
03/27/00 20:44	13.1	13.3	13.9	13.6	18.4
03/27/00 20:45	13.2	13.3	13.9	13.6	18.7
03/27/00 20:46	13.2	13.4	14.0	13.6	18.3
Final Average*	**12.7**	**8.9**	**13.7**	**13.3**	**18.6**
Maximum*	**13.9**	**14.0**	**15.1**	**14.6**	**23.5**
Minimum*	**10.9**	**0.0**	**12.0**	**11.5**	**16.4**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 2
Scrubber

Enertec NTDAHS®
Average Values Report
04/10/00 09:05

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/28/00 08:37
Period End: 03/28/00 12:02
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average AVentDiff in wg	Average BVentDiff in wg	Average CVentDiff in wg	Average DVentDiff in wg	Average Opacity %
03/28/00 08:37	14.5	15.0	15.5	15.0	18.8
03/28/00 08:38	14.5	14.8	15.4	14.9	18.9
03/28/00 08:39	14.7	15.2	15.7	15.3	19.5
03/28/00 08:40	14.9	15.5	15.9	15.6	19.2
03/28/00 08:41	14.8	15.0	15.6	15.1	17.4
03/28/00 08:42	14.5	14.7	15.3	14.8	16.7
03/28/00 08:43	14.4	14.8	15.4	14.9	19.1
03/28/00 08:44	14.7	15.0	15.6	15.2	18.4
03/28/00 08:45	14.6	14.8	15.4	14.9	17.7
03/28/00 08:46	14.4	14.8	15.4	14.8	18.3
03/28/00 08:47	14.4	14.8	15.4	14.8	18.4
03/28/00 08:48	14.3	14.6	15.3	14.7	17.1
03/28/00 08:49	14.2	14.5	15.2	14.6	18.3
03/28/00 08:50	14.2	14.6	15.3	14.7	19.1
03/28/00 08:51	14.4	14.7	15.3	14.8	17.7
03/28/00 08:52	14.2	14.4	15.0	14.5	17.3
03/28/00 08:53	14.1	14.4	15.0	14.5	17.8
03/28/00 08:54	14.1	14.5	15.0	14.6	18.3
03/28/00 08:55	14.1	14.4	14.9	14.5	18.1
03/28/00 08:56	14.1	14.3	14.8	14.4	17.5
03/28/00 08:57	13.9	14.3	14.8	14.4	18.6
03/28/00 08:58	14.0	14.3	14.8	14.4	18.1
03/28/00 08:59	13.9	14.2	14.8	14.3	17.8
03/28/00 09:00	13.8	14.1	14.8	14.2	17.9
03/28/00 09:01	13.8	14.2	14.8	14.3	18.8
03/28/00 09:02	13.9	14.3	14.8	14.4	19.2
03/28/00 09:03	14.1	14.5	15.0	14.7	20.2
03/28/00 09:04	14.3	14.7	15.2	14.9	19.9
03/28/00 09:05	14.4	14.8	15.2	14.9	19.3
03/28/00 09:06	14.4	14.9	15.3	15.0	19.4
03/28/00 09:07	14.5	14.9	15.4	15.0	19.7
03/28/00 09:08	14.6	15.0	15.6	15.1	19.6
03/28/00 09:09	14.6	15.0	15.7	15.1	19.2
03/28/00 09:10	14.7	15.0	15.6	15.1	18.4
03/28/00 09:11	14.7	15.1	15.6	15.2	19.2
03/28/00 09:12	14.8	15.2	15.7	15.4	19.2
03/28/00 09:13	14.9	15.2	15.6	15.3	18.1
03/28/00 09:14	14.7	15.0	15.5	15.1	18.0
03/28/00 09:15	14.7	15.1	15.6	15.1	18.2
03/28/00 09:16	14.6	14.9	15.5	15.0	17.7
03/28/00 09:17	14.8	15.3	15.9	15.4	20.4
03/28/00 09:18	14.9	15.1	15.7	15.2	17.1
03/28/00 09:19	14.5	14.9	15.4	14.9	17.3
03/28/00 09:20	14.4	14.8	15.3	14.8	17.3
03/28/00 09:21	14.3	14.7	15.2	14.8	17.7
03/28/00 09:22	14.2	14.6	15.2	14.7	17.8
03/28/00 09:23	14.2	14.5	15.1	14.6	17.5
03/28/00 09:24	14.1	14.4	15.0	14.5	17.5

03/28/00 10:29	14.3	14.6	15.2	14.6	17.2
03/28/00 10:30	14.2	14.5	15.1	14.6	17.7
03/28/00 10:31	14.1	14.4	15.1	14.6	18.1
03/28/00 10:32	14.3	14.7	15.3	14.9	19.1
03/28/00 10:33	14.5	14.9	15.4	15.0	20.2
03/28/00 10:34	14.6	14.8	15.3	15.0	17.8
03/28/00 10:35	14.4	14.8	15.2	14.7	17.8
03/28/00 10:36	14.3	14.7	15.2	14.8	19.2
03/28/00 10:37	14.4	14.8	15.3	14.9	18.2
03/28/00 10:38	14.5	14.9	15.4	15.0	19.4
03/28/00 10:39	14.8	15.2	15.7	15.4	19.8
03/28/00 10:40	14.8	15.1	15.6	15.2	18.4
03/28/00 10:41	14.6	15.0	15.5	15.0	18.3
03/28/00 10:42	14.6	14.9	15.5	14.9	17.3
03/28/00 10:43	14.4	14.7	15.3	14.8	18.3
03/28/00 10:44	14.4	14.8	15.4	14.8	18.2
03/28/00 10:45	14.4	14.8	15.4	14.9	18.2
03/28/00 10:46	14.5	14.9	15.6	15.0	20.0
03/28/00 10:47	14.9	15.4	15.9	15.4	21.0
03/28/00 10:48	15.2	15.8	16.2	15.8	21.3
03/28/00 10:49	15.3	15.7	16.2	15.8	20.5
03/28/00 10:50	15.5	15.8	16.3	15.9	19.1
03/28/00 10:51	15.3	15.5	16.0	15.6	17.6
03/28/00 10:52	15.2	15.5	16.1	15.7	19.2
03/28/00 10:53	15.2	15.3	15.9	15.4	16.6
03/28/00 10:54	14.9	15.2	15.7	15.2	17.5
03/28/00 10:55	14.9	15.2	15.8	15.3	18.0
03/28/00 10:56	14.9	15.1	15.6	15.2	17.2
03/28/00 10:57	14.7	15.0	15.5	15.1	18.1
03/28/00 10:58	14.7	15.1	15.6	15.2	18.2
03/28/00 10:59	14.6	15.0	15.5	15.0	17.6
03/28/00 11:00	14.6	14.9	15.4	15.0	18.2
03/28/00 11:01	14.6	15.1	15.5	15.1	18.7
03/28/00 11:02	14.7	15.0	15.5	15.1	18.8
03/28/00 11:03	14.6	14.9	15.4	15.0	17.4
03/28/00 11:04	14.6	14.9	15.5	15.0	18.2
03/28/00 11:05	14.5	14.9	15.4	14.9	18.0
03/28/00 11:06	14.4	14.6	15.3	14.7	17.2
03/28/00 11:07	14.3	14.6	15.1	14.7	18.1
03/28/00 11:08	14.3	14.7	15.2	14.8	18.8
03/28/00 11:09	14.4	14.9	15.3	14.9	19.5
03/28/00 11:10	14.6	15.0	15.5	15.1	18.9
03/28/00 11:11	14.5	14.8	15.3	14.9	18.3
03/28/00 11:12	14.4	14.6	15.3	14.7	17.3
03/28/00 11:13	14.2	14.5	15.2	14.6	18.2
03/28/00 11:14	14.2	14.6	15.2	14.6	17.9
03/28/00 11:15	14.3	14.7	15.2	14.8	19.2
03/28/00 11:16	14.4	14.7	15.2	14.7	18.0
03/28/00 11:17	14.3	14.6	15.1	14.6	18.2
03/28/00 11:18	14.1	14.4	15.0	14.5	17.4
03/28/00 11:19	14.0	14.4	15.0	14.5	18.5
03/28/00 11:20	14.0	14.3	15.0	14.5	17.8
03/28/00 11:21	14.0	14.4	15.0	14.4	18.7
03/28/00 11:22	14.1	14.4	15.0	14.6	18.4
03/28/00 11:23	14.1	14.5	15.0	14.5	19.0
03/28/00 11:24	14.1	14.5	15.0	14.6	18.3
03/28/00 11:25	14.1	14.5	15.0	14.6	18.6
03/28/00 11:26	14.1	14.5	15.1	14.6	19.3
03/28/00 11:27	14.3	14.7	15.2	14.8	19.0
03/28/00 11:28	14.4	14.7	15.2	14.9	19.4
03/28/00 11:29	14.5	14.9	15.4	15.0	18.4
03/28/00 11:30	14.3	14.6	15.2	14.7	18.0
03/28/00 11:31	14.3	14.7	15.4	14.9	19.1
03/28/00 11:32	14.4	14.7	15.2	14.7	17.7

03/28/00 11:33	14.3	14.7	15.4	14.9	19.3
03/28/00 11:34	14.5	14.9	15.5	15.0	20.2
03/28/00 11:35	14.7	15.0	15.5	15.1	18.5
03/28/00 11:36	14.5	14.7	15.3	14.8	17.3
03/28/00 11:37	14.3	14.6	15.2	14.7	17.5
03/28/00 11:38	14.3	14.6	15.3	14.8	18.8
03/28/00 11:39	14.4	14.7	15.3	14.8	18.0
03/28/00 11:40	14.3	14.6	15.2	14.7	17.7
03/28/00 11:41	14.2	14.5	15.1	14.7	18.1
03/28/00 11:42	14.2	14.6	15.2	14.8	18.7
03/28/00 11:43	14.3	14.7	15.2	14.8	19.2
03/28/00 11:44	14.5	14.9	15.4	15.0	19.6
03/28/00 11:45	14.5	14.8	15.3	14.9	18.6
03/28/00 11:46	14.4	14.7	15.2	14.8	18.1
03/28/00 11:47	14.4	14.6	15.2	14.8	17.9
03/28/00 11:48	14.3	14.6	15.3	14.7	18.5
03/28/00 11:49	14.3	14.6	15.2	14.7	18.5
03/28/00 11:50	14.3	14.7	15.2	14.8	18.7
03/28/00 11:51	14.5	15.0	15.4	15.1	20.2
03/28/00 11:52	14.6	15.1	15.5	15.1	19.3
03/28/00 11:53	15.1	15.8	16.3	15.9	22.5
03/28/00 11:54	15.2	15.4	16.0	15.4	18.3
03/28/00 11:55	14.8	15.1	15.7	15.2	17.3
03/28/00 11:56	14.6	15.0	15.6	15.0	17.5
03/28/00 11:57	14.6	14.9	15.6	15.0	17.3
03/28/00 11:58	14.6	15.0	15.5	15.1	18.9
03/28/00 11:59	15.0	15.5	16.0	15.6	20.2
03/28/00 12:00	15.0	15.3	15.8	15.4	19.1
03/28/00 12:01	15.0	15.3	15.8	15.5	18.5
Final Average*	**14.4**	**14.8**	**15.3**	**14.9**	**18.5**
Maximum*	**15.5**	**15.8**	**16.3**	**15.9**	**22.5**
Minimum*	**13.8**	**14.1**	**14.8**	**14.2**	**16.6**

*Does not include Invalid Averaging Periods ("N/A")

Boswell 4
Run 3
Scrubber

Enertec NTDAHS®
Average Values Report
04/10/00 09:06

Company: Minnesota Power
Plant: PO Box 128
City/St: Cohasset, MN 55721
Source: UNIT_4

Period Start: 03/28/00 13:25
Period End: 03/28/00 16:58
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start	Average AVentDiff in wg	Average BVentDiff in wg	Average CVentDiff in wg	Average DVentDiff in wg	Average Opacity %
03/28/00 13:25	15.4	15.9	16.4	16.0	20.1
03/28/00 13:26	15.7	16.3	16.8	16.4	21.9
03/28/00 13:27	15.6	15.8	16.4	15.8	17.7
03/28/00 13:28	15.4	15.8	16.3	15.9	18.2
03/28/00 13:29	15.4	15.8	16.3	15.9	18.7
03/28/00 13:30	15.4	15.7	16.3	15.8	18.7
03/28/00 13:31	15.5	15.9	16.4	16.1	19.5
03/28/00 13:32	15.8	16.2	16.7	16.3	18.5
03/28/00 13:33	15.7	16.0	16.6	16.2	19.2
03/28/00 13:34	15.6	15.7	16.4	15.9	16.9
03/28/00 13:35	15.4	15.7	16.4	15.8	17.6
03/28/00 13:36	15.3	15.6	16.3	15.7	17.6
03/28/00 13:37	15.1	15.5	16.0	15.6	17.3
03/28/00 13:38	15.1	15.5	16.0	15.6	18.2
03/28/00 13:39	15.2	15.5	15.9	15.6	17.6
03/28/00 13:40	15.1	15.5	15.9	15.6	17.8
03/28/00 13:41	15.0	15.4	15.9	15.5	19.3
03/28/00 13:42	15.4	16.0	16.4	16.1	20.2
03/28/00 13:43	15.3	15.5	16.1	15.5	16.7
03/28/00 13:44	14.9	15.1	15.7	15.2	17.3
03/28/00 13:45	14.9	15.4	15.9	15.5	18.9
03/28/00 13:46	15.1	15.5	16.0	15.6	18.9
03/28/00 13:47	15.0	15.3	15.7	15.4	17.2
03/28/00 13:48	14.8	15.2	15.7	15.3	18.1
03/28/00 13:49	14.9	15.3	15.8	15.3	18.0
03/28/00 13:50	14.8	15.1	15.6	15.2	18.2
03/28/00 13:51	14.9	15.3	15.8	15.4	18.1
03/28/00 13:52	14.7	15.1	15.6	15.1	17.4
03/28/00 13:53	14.7	15.2	15.7	15.2	19.3
03/28/00 13:54	14.9	15.4	15.9	15.5	20.8
03/28/00 13:55	15.5	16.0	16.4	16.1	19.4
03/28/00 13:56	15.2	15.6	16.1	15.6	18.5
03/28/00 13:57	15.0	15.4	15.9	15.4	17.3
03/28/00 13:58	14.9	15.2	15.7	15.2	17.4
03/28/00 13:59	14.7	15.1	15.6	15.1	17.1
03/28/00 14:00	14.6	15.0	15.5	15.0	18.0
03/28/00 14:01	14.7	15.2	15.5	15.2	18.6
03/28/00 14:02	14.7	15.0	15.4	15.1	17.7
03/28/00 14:03	14.6	14.9	15.3	15.0	17.4
03/28/00 14:04	14.5	14.9	15.4	14.9	17.8
03/28/00 14:05	14.4	14.7	15.3	14.8	17.7
03/28/00 14:06	14.2	14.5	15.1	14.6	16.9
03/28/00 14:07	14.1	14.4	15.0	14.6	17.8
03/28/00 14:08	14.1	14.4	14.9	14.5	18.0
03/28/00 14:09	14.5	15.0	15.5	15.1	19.4
03/28/00 14:10	14.4	14.6	15.2	14.7	17.7
03/28/00 14:11	14.3	14.7	15.2	14.7	18.8
03/28/00 14:12	14.3	14.6	15.2	14.7	17.6

03/28/00 14:13	14.2	14.6	15.1	14.7	19.4
03/28/00 14:14	14.5	14.9	15.4	15.0	18.7
03/28/00 14:15	14.6	15.1	15.5	15.2	19.5
03/28/00 14:16	14.5	14.8	15.3	14.8	17.9
03/28/00 14:17	14.4	14.8	15.3	14.9	18.9
03/28/00 14:18	14.5	14.9	15.3	14.9	17.9
03/28/00 14:19	14.4	14.9	15.3	14.9	18.4
03/28/00 14:20	14.4	14.7	15.2	14.8	17.8
03/28/00 14:21	14.4	14.8	15.3	14.9	19.2
03/28/00 14:22	14.5	14.9	15.3	15.0	18.3
03/28/00 14:23	14.6	15.2	15.6	15.2	20.5
03/28/00 14:24	14.7	14.9	15.3	14.9	16.7
03/28/00 14:25	14.5	14.9	15.5	15.0	19.5
03/28/00 14:26	14.6	15.1	15.6	15.2	19.2
03/28/00 14:27	14.6	14.9	15.4	15.0	18.8
03/28/00 14:28	14.7	15.0	15.5	15.1	17.7
03/28/00 14:29	14.7	15.1	15.7	15.3	20.5
03/28/00 14:30	15.1	15.6	16.0	15.7	19.8
03/28/00 14:31	15.0	15.3	15.8	15.4	18.0
03/28/00 14:32	14.9	15.4	15.9	15.4	18.9
03/28/00 14:33	15.0	15.3	15.9	15.4	19.2
03/28/00 14:34	15.2	15.7	16.2	15.9	20.1
03/28/00 14:35	15.5	15.9	16.4	16.1	21.1
03/28/00 14:36	15.7	16.3	16.7	16.4	20.6
03/28/00 14:37	15.9	16.2	16.7	16.3	17.9
03/28/00 14:38	15.5	15.7	16.3	15.8	17.1
03/28/00 14:39	15.4	15.9	16.4	16.0	18.7
03/28/00 14:40	15.5	15.9	16.4	16.0	18.1
03/28/00 14:41	15.5	15.9	16.4	16.0	20.2
03/28/00 14:42	16.2	16.9	17.4	17.0	19.9
03/28/00 14:43	15.9	16.2	16.8	16.3	19.5
03/28/00 14:44	16.5	17.4	17.8	17.4	23.8
03/28/00 14:45	17.1	17.7	18.1	17.8	21.9
03/28/00 14:46	17.2	17.5	18.0	17.6	19.9
03/28/00 14:47	17.1	17.5	18.0	17.5	19.0
03/28/00 14:48	16.9	17.3	17.9	17.4	16.9
03/28/00 14:49	16.5	16.7	17.4	16.8	17.1
03/28/00 14:50	16.6	17.1	17.6	17.2	19.3
03/28/00 14:51	16.7	17.1	17.6	17.2	17.8
03/28/00 14:52	16.5	16.8	17.3	16.8	17.0
03/28/00 14:53	16.4	16.8	17.3	16.8	17.5
03/28/00 14:54	16.2	16.5	17.1	16.6	17.0
03/28/00 14:55	16.2	16.7	17.3	16.8	19.5
03/28/00 14:56	16.5	16.7	17.2	16.9	18.0
03/28/00 14:57	16.4	16.7	17.2	16.8	18.2
03/28/00 14:58	16.2	16.5	17.0	16.6	16.8
03/28/00 14:59	15.7	15.9	16.6	16.0	15.8
03/28/00 15:00	15.6	16.0	16.6	16.0	17.2
03/28/00 15:01	15.5	15.8	16.4	15.9	16.7
03/28/00 15:02	15.2	15.5	16.2	15.6	16.7
03/28/00 15:03	15.1	15.6	16.2	15.6	17.2
03/28/00 15:04	15.1	15.4	16.0	15.5	17.1
03/28/00 15:05	15.3	15.9	16.4	16.0	20.1
03/28/00 15:06	15.1	15.3	15.8	15.3	16.3
03/28/00 15:07	14.9	15.2	15.8	15.3	16.7
03/28/00 15:08	14.6	14.9	15.5	14.9	17.2
03/28/00 15:09	14.6	15.1	15.6	15.1	17.6
03/28/00 15:10	14.7	15.1	15.7	15.2	19.1
03/28/00 15:11	14.9	15.4	15.9	15.4	19.5
03/28/00 15:12	15.1	15.5	16.1	15.6	18.8
03/28/00 15:13	15.0	15.4	16.0	15.5	19.0
03/28/00 15:14	15.1	15.6	16.1	15.6	19.3
03/28/00 15:15	15.2	15.7	16.3	15.8	19.7
03/28/00 15:16	15.5	16.0	16.5	16.0	20.2

03/28/00 15:17	15.5	15.9	16.5	16.0	19.3
03/28/00 15:18	15.7	16.3	16.8	16.4	21.1
03/28/00 15:19	15.9	16.2	16.7	16.2	17.1
03/28/00 15:20	15.5	16.1	16.5	16.1	19.3
03/28/00 15:21	15.7	16.2	16.6	16.2	19.7
03/28/00 15:22	16.1	16.6	17.1	16.7	18.8
03/28/00 15:23	15.8	16.0	16.6	16.1	17.4
03/28/00 15:24	15.6	16.1	16.6	16.2	19.2
03/28/00 15:25	15.8	16.3	16.7	16.4	19.7
03/28/00 15:26	16.3	16.8	17.3	16.9	20.5
03/28/00 15:27	16.2	16.5	17.0	16.6	17.2
03/28/00 15:28	15.8	16.1	16.7	16.1	17.2
03/28/00 15:29	15.9	16.5	17.0	16.6	19.5
03/28/00 15:30	15.9	16.3	16.8	16.3	19.0
03/28/00 15:31	16.8	17.7	18.2	17.8	24.1
03/28/00 15:32	17.4	17.7	18.3	17.7	19.9
03/28/00 15:33	16.8	17.0	17.6	17.0	16.5
03/28/00 15:34	16.4	16.6	17.3	16.7	16.7
03/28/00 15:35	16.4	16.9	17.4	17.0	20.0
03/28/00 15:36	17.1	17.6	18.1	17.7	20.7
03/28/00 15:37	16.9	17.2	17.8	17.2	17.0
03/28/00 15:38	16.7	17.3	18.0	17.4	20.9
03/28/00 15:39	17.5	18.2	18.6	18.3	21.7
03/28/00 15:40	17.9	18.4	18.9	18.4	20.4
03/28/00 15:41	17.7	18.1	18.7	18.1	19.0
03/28/00 15:42	17.7	18.2	18.8	18.2	19.1
03/28/00 15:43	17.8	18.2	18.8	18.2	19.3
03/28/00 15:44	17.9	18.2	18.7	18.2	17.4
03/28/00 15:45	17.3	17.6	18.3	17.6	16.3
03/28/00 15:46	17.5	18.2	18.8	18.3	21.0
03/28/00 15:47	17.7	17.9	18.4	18.0	15.3
03/28/00 15:48	17.1	17.4	18.0	17.5	17.4
03/28/00 15:49	17.1	17.4	18.0	17.5	16.1
03/28/00 15:50	16.8	17.1	17.8	17.2	16.5
03/28/00 15:51	16.7	17.0	17.7	17.1	17.4
03/28/00 15:52	16.6	16.9	17.6	17.0	16.9
03/28/00 15:53	16.2	16.3	17.0	16.4	16.0
03/28/00 15:54	16.0	16.3	17.0	16.4	16.5
03/28/00 15:55	16.0	16.4	17.1	16.5	17.9
03/28/00 15:56	16.0	16.3	16.9	16.4	17.7
03/28/00 15:57	16.0	16.2	16.9	16.4	17.2
03/28/00 15:58	15.6	15.9	16.5	15.9	15.9
03/28/00 15:59	15.4	15.8	16.4	15.8	17.8
03/28/00 16:00	15.5	16.1	16.7	16.2	19.0
03/28/00 16:01	15.5	15.9	16.5	16.0	18.4
03/28/00 16:02	15.4	15.7	16.3	15.7	16.2
03/28/00 16:03	15.0	15.3	15.9	15.4	16.8
03/28/00 16:04	15.0	15.5	16.1	15.6	19.5
03/28/00 16:05	15.5	16.0	16.5	16.2	20.0
03/28/00 16:06	15.5	15.8	16.3	15.9	17.9
03/28/00 16:07	15.2	15.5	16.1	15.6	16.7
03/28/00 16:08	15.3	15.9	16.5	16.1	21.8
03/28/00 16:09	15.9	16.2	16.8	16.3	18.5
03/28/00 16:10	15.9	16.3	16.9	16.5	19.7
03/28/00 16:11	15.6	15.9	16.5	15.9	18.9
03/28/00 16:12	15.7	16.1	16.6	16.1	17.8
03/28/00 16:13	15.8	16.4	16.8	16.5	20.7
03/28/00 16:14	16.1	16.6	17.1	16.7	19.1
03/28/00 16:15	15.9	16.1	16.7	16.2	16.9
03/28/00 16:16	15.6	15.8	16.5	15.9	17.2
03/28/00 16:17	15.4	15.9	16.5	15.9	17.3
03/28/00 16:18	15.2	15.5	16.2	15.6	16.9
03/28/00 16:19	15.1	15.5	16.1	15.6	17.5
03/28/00 16:20	15.1	15.6	16.0	15.7	18.3

03/28/00 16:21	15.2	15.6	16.1	15.7	18.4
03/28/00 16:22	15.4	15.9	16.4	16.0	20.2
03/28/00 16:23	15.4	15.5	16.2	15.6	16.2
03/28/00 16:24	15.0	15.3	15.9	15.4	18.0
03/28/00 16:25	15.5	16.0	16.5	16.1	19.1
03/28/00 16:26	15.4	15.8	16.3	15.9	19.1
03/28/00 16:27	15.4	15.7	16.3	15.8	17.8
03/28/00 16:28	15.2	15.6	16.2	15.6	17.7
03/28/00 16:29	15.1	15.4	16.1	15.5	18.3
03/28/00 16:30	15.1	15.6	16.1	15.7	18.4
03/28/00 16:31	15.3	15.7	16.2	15.8	19.3
03/28/00 16:32	15.4	15.9	16.3	15.9	18.9
03/28/00 16:33	15.4	15.8	16.3	15.8	18.4
03/28/00 16:34	15.4	15.8	16.3	15.8	17.5
03/28/00 16:35	15.1	15.4	16.1	15.5	17.2
03/28/00 16:36	15.0	15.3	15.9	15.4	17.3
03/28/00 16:37	15.2	15.9	16.4	16.0	20.5
03/28/00 16:38	15.5	16.0	16.5	16.1	20.3
03/28/00 16:39	15.5	15.8	16.4	15.9	18.6
03/28/00 16:40	15.7	16.1	16.6	16.2	18.9
03/28/00 16:41	15.5	15.9	16.3	15.9	17.6
03/28/00 16:42	15.3	15.7	16.3	15.7	18.3
03/28/00 16:43	15.6	16.2	16.7	16.3	21.7
03/28/00 16:44	16.5	17.5	18.0	17.6	26.3
03/28/00 16:45	17.3	17.7	18.2	17.7	20.7
03/28/00 16:46	17.0	17.1	17.7	17.1	17.3
03/28/00 16:47	16.3	16.5	17.1	16.5	16.1
03/28/00 16:48	16.1	16.6	17.2	16.6	19.2
03/28/00 16:49	16.7	17.3	17.7	17.3	19.4
03/28/00 16:50	16.5	16.8	17.3	16.8	16.6
03/28/00 16:51	16.1	16.4	17.0	16.4	16.1
03/28/00 16:52	15.9	16.3	16.9	16.3	17.1
03/28/00 16:53	15.8	16.3	16.9	16.4	18.7
03/28/00 16:54	16.0	16.3	16.9	16.4	17.6
03/28/00 16:55	15.9	16.4	16.9	16.4	18.5
03/28/00 16:56	15.7	16.0	16.6	16.1	16.7
03/28/00 16:57	15.6	15.9	16.5	16.0	17.4
Final Average*	**15.6**	**16.0**	**16.5**	**16.1**	**18.5**
Maximum*	**17.9**	**18.4**	**18.9**	**18.4**	**26.3**
Minimum*	**14.1**	**14.4**	**14.9**	**14.5**	**15.3**

*Does not include Invalid Averaging Periods ("N/A")

APPENDIX C
RAW TEST DATA

ONTARIO HYDRO METHOD DATA INPUTS
Unit 2 Inlet

Test Data			
Run number	1	2	3
Location		Unit 2 Inlet	
Date	3/23/00	3/24/00	3/24/00
Time period	1245-1508	0820-1040	1230-1445
Operator	JM/LF/TB	JM/LF/TB	JM/LF/TB
Process Data			
Unit Load, MW	56.5	56.7	56.7
Coal feed rate, lb/hr.	64520	64760	64760
Coal Btu content, Btu/lb.(as received)	8924	8884	8906
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	623.4	579.3	572.0
Inputs For Calcs.			
Sq. rt. delta P	0.580764	0.64763	0.61423
Delta H	1.21480	1.47560	1.35680
Stack temp. (deg.F)	353.90	343.00	347.10
Meter temp. (deg.F)	89.40	78.00	84.30
Sample volume (act.)	76.043	82.593	80.683
Barometric press. (in.Hg)	28.70	28.29	28.20
Volume H_2O imp. (ml)	162.7	177.3	187.4
Weight chnge sil. gel (g)	14.1	14.3	16.1
% CO_2	13.6	13.1	13.4
% O_2	6.0	6.7	6.4
% N	80.4	80.2	80.2
Area of stack (sq.ft.)	104.50	104.50	104.50
Sample time (min.)	125.00	125.00	125.00
Static pressure (in.H_2O)	-11.00	-11.40	-11.50
Nozzle dia. (in.)	0.275	0.275	0.275
Meter box cal.	1.0072	1.0072	1.0072
Cp of pitot tube	0.84	0.84	0.84
Traverse points	25	25	25
Mercury Laboratory Report Data			
Particulate bound, ug	4.5891	3.4591	1.4046
Oxidized, ug	3.0250	2.1867	1.9700
Elemental, ug	2.6600	2.5533	4.2717
Total mercury catch, ug	10.2741	8.1991	7.6463

Note: Non-detects not included in Total mercury catch value.

ONTARIO HYDRO METHOD DATA INPUTS
Unit 2 Outlet

Test Data				
Run number	1	2		3
Location		Unit 2 Outlet		
Date	3/23/00	3/24/00		3/24/00
Time period	1245-1507	0821-1038		1230-1444
Operator	JP/KA/PG	JP/KA/PG		JP/KA/PG
Process Data				
Unit Load, MW	56.5	56.7		56.7
Coal feed rate, lb/hr.	64520	64760		64760
Coal Btu content, Btu/lb.(as received)	8924	8884		8906
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	623.4	579.3		572.0
Inputs For Calcs.				
Sq. rt. delta P	0.635200	0.61410		0.60997
Delta H	1.30030	1.19733		1.19000
Stack temp. (deg.F)	335.80	331.10		335.10
Meter temp. (deg.F)	73.20	62.20		63.90
Sample volume (act.)	75.845	74.537		74.139
Barometric press. (in.Hg)	28.70	28.26		28.20
Volume H_2O imp. (ml)	160.3	163.6		174.8
Weight chnge sil. gel (g)	17.1	14.3		15.5
% CO_2	13.0	12.6		12.7
% O_2	6.6	7.2		7.1
% N	80.4	80.2		80.2
Area of stack (sq.ft.)	100.00	100.00		100.00
Sample time (min.)	120.00	120.00		120.00
Static pressure (in.H_2O)	-19.00	-18.00		-19.00
Nozzle dia. (in.)	0.270	0.270		0.270
Meter box cal.	0.9958	0.9958		0.9958
Cp of pitot tube	0.84	0.84		0.84
Traverse points	30	30		30
Mercury Laboratory Report Data				
Particulate bound, ug	0.1200	0.0055	<	0.0020
Oxidized, ug	2.0500	0.5350		0.8950
Elemental, ug	0.2233	0.3600		0.1850
Total mercury catch, ug	2.3933	0.9005		1.0800

TABLE A-3
ONTARIO HYDRO METHOD DATA INPUTS
Unit 3 Inlet

Test Data			
Run number	1	2	3
Location		Unit 3 Inlet	
Date	3/21/00	3/21/00	3/22/00
Time period	0902-1205	1515-1759	0835-1111
Operator	JM/LF/TB	JM/LF/TB	JM/LF/TB
Process Data			
Unit Load, MW	338.0	333.0	334.0
Coal feed rate, lb/hr.	374260	368400	369200
Coal Btu content, Btu/lb.(as received)	8921	8641	8644
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	4217.6	4201.9	4073.3
Inputs For Calcs.			
Sq. rt. delta P (overall flowrate)	0.331068	0.339267	0.326993
Sq. rt. delta P (isokinetic test)	0.367640	0.37960	0.37120
Delta H	0.91775	1.05580	1.01350
Stack temp. (deg.F)	282.90	299.30	291.50
Meter temp. (deg.F)	103.80	105.70	98.30
Sample volume (act.)	64.783	66.431	65.863
Barometric press. (in.Hg)	28.70	28.67	28.70
Volume H_2O imp. (ml)	133.6	162.6	147.3
Weight chnge sil. gel (g)	14.6	16.3	15.2
% CO_2	14.6	14.6	14.5
% O_2	5.4	5.4	5.5
% N	80.0	80.0	80.0
Area of stack (sq.ft.)	1149.50	1149.50	1149.50
Sample time (min.)	120.00	120.00	120.00
Static pressure (in.H_2O)	-14.80	-14.60	-14.40
Nozzle dia. (in.)	0.307	0.315	0.315
Meter box cal.	0.9926	0.9926	0.9926
Cp of pitot tube	0.84	0.84	0.84
Traverse points	40	40	40
Mercury Laboratory Report Data			
Particulate bound, ug	0.0206	< 0.0266	0.0844
Oxidized, ug	0.3533	0.4600	0.9000
Elemental, ug	8.6033	8.6950	7.5500
Total mercury catch, ug	8.9772	9.1550	8.5344

Note: Non-detects not included in Total mercury catch value.

TABLE A-4
ONTARIO HYDRO METHOD DATA INPUTS
Unit 3 Outlet

Test Data				
Run number	1		2	3
Location			Unit 3 Outlet	
Date	3/21/00		3/21/00	3/22/00
Time period	0903-1200		1516-1756	0836-1112
Operator	JP/KA/PG		JP/KA/PG	JP/KA/PG
Process Data				
Unit Load, MW	338.0		333.0	334.0
Coal feed rate, lb/hr.	374260		368400	369200
Coal Btu content, Btu/lb.(as received)	8921		8641	8644
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	4217.6		4201.9	4073.3
Inputs For Calcs.				
Sq. rt. delta P	0.577900		0.59297	0.58470
Delta H	1.32560		1.35280	1.30080
Stack temp. (deg.F)	124.20		123.40	123.20
Meter temp. (deg.F)	52.20		53.40	54.40
Sample volume (act.)	80.225		80.084	79.571
Barometric press. (in.Hg)	28.70		28.67	28.70
Volume H_2O imp. (ml)	236.1		247.3	241.4
Weight chnge sil. gel (g)	22.0		21.6	20.8
% CO_2	13.8		13.4	13.0
% O_2	6.0		6.4	6.7
% N	80.2		80.2	80.3
Area of stack (sq.ft.)	452.50		452.50	452.50
Sample time (min.)	125.00		125.00	125.00
Static pressure (in.H_2O)	-1.80		-1.80	-1.80
Nozzle dia. (in.)	0.273		0.273	0.273
Meter box cal.	0.9979		0.9979	0.9979
Cp of pitot tube	0.84		0.84	0.84
Traverse points	25		25	25
Mercury Laboratory Report Data				
Particulate bound, ug	0.0040	<	0.0020	0.0035
Oxidized, ug	0.0867		0.1133	0.1050
Elemental, ug	10.9016		9.7650	9.7150
Total mercury catch, ug	10.9923		9.8783	9.8235

ONTARIO HYDRO METHOD DATA INPUTS
Unit 4 Inlet

Test Data			
Run number	1	2	3
Location		Unit 4 Inlet	
Date	3/27/00	3/28/00	3/28/00
Time period	1700-2047	0837-1202	1328-1658
Operator	PG/LF/KA	PG/LF/KA	PG/LF/KA
Process Data			
Unit Load, MW	540.0	540.0	540.0
Coal feed rate, lb/hr.	589240	589400	589400
Coal Btu content, Btu/lb.(as received)	8851	8989	8916
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	5928.0	5834.0	5588.0
Inputs For Calcs.			
Sq. rt. delta P (isokinetic test)	1.063520	1.03770	1.03077
Delta H	1.08167	1.00708	1.02875
Stack temp. (deg.F)	309.60	285.50	277.10
Meter temp. (deg.F)	45.10	46.60	46.10
Sample volume (act.)	67.385	65.190	67.112
Barometric press. (in.Hg)	28.11	28.47	28.50
Volume H_2O imp. (ml)	149.7	165.1	155.0
Weight chnge sil. gel (g)	12.5	12.4	13.7
% CO_2	14.0	14.4	14.4
% O_2	5.6	5.2	5.2
% N	80.4	80.4	80.4
Area of stack (sq.ft.)	265.80	265.80	265.80
Sample time (min.)	120.00	120.00	120.00
Static pressure (in.H_2O)	-15.00	-16.00	-15.00
Nozzle dia. (in.)	0.195	0.195	0.195
Meter box cal.	0.9926	0.9926	0.9926
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24
Mercury Laboratory Report Data			
Particulate bound, ug	0.1615	4.7789	4.5240
Oxidized, ug	0.5250	1.7067	0.9033
Elemental, ug	8.0500	2.3483	1.9250
Total mercury catch, ug	8.7365	8.8339	7.3523

Note: Non-detects not included in Total mercury catch value.

ONTARIO HYDRO METHOD DATA INPUTS
Unit 4 Outlet

Test Data			
Run number	1	2	3
Location		Unit 4 Outlet	
Date	3/27/00	3/28/00	3/28/00
Time period	1700-2046	0837-1200	1325-1658
Operator	JM/JP/TB	JM/JP/TB	JM/JP/TB
Process Data			
Unit Load, MW	540.0	540.0	540.0
Coal feed rate, lb/hr.	589240	589400	589400
Coal Btu content, Btu/lb.(as received)	8851	8989	8916
Heat Input, 10^6 Btu/hr (Avg. F-Factor)	5928.0	5834.0	5588.0
Inputs For Calcs.			
Sq. rt. delta P	0.450330	0.44676	0.44200
Delta H	1.89708	1.36083	1.33291
Stack temp. (deg.F)	153.00	153.92	156.50
Meter temp. (deg.F)	92.30	87.48	91.04
Sample volume (act.)	92.321	78.466	76.733
Barometric press. (in.Hg)	28.11	28.47	28.50
Volume H_2O imp. (ml)	257.9	230.8	230.0
Weight chnge sil. gel (g)	27.5	21.3	21.6
% CO_2	14.4	14.2	13.8
% O_2	5.2	5.6	6.0
% N	80.4	80.2	80.2
Area of stack (sq.ft.)	1094.64	1094.64	1094.64
Sample time (min.)	120.00	120.00	120.00
Static pressure (in.H_2O)	0.43	0.69	0.74
Nozzle dia. (in.)	0.327	0.302	0.302
Meter box cal.	1.0072	1.0072	1.0072
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12
Mercury Laboratory Report Data			
Particulate bound, ug	0.0490	0.3500	0.4660
Oxidized, ug	0.2250	0.7800	0.9733
Elemental, ug	11.5250	10.3867	9.2900
Total mercury catch, ug	11.7990	11.5167	10.7293

Sample and Velocity Traverse Point Data Sheet - Method 1

Client DCE/MP
Loaction/Plant Unit 2 Inlet
Source

Operator Mills
Date 3/22/00
W.O. Number 20009-011.006 -1100

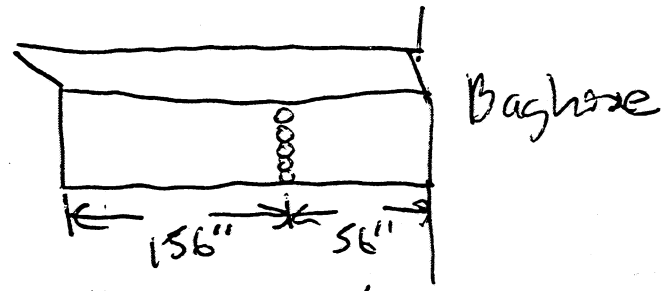
Duct Type	☐ Circular	☒ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	130"
Port Depth (in.) = D	16"
Depth of Duct, diameter (in.) = C-D	114"
Area of Duct (ft²) 114" x 132"	104.5
Total Traverse Points	25
Total Traverse Points per Port	5

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	

Flow Disturbances	
Upstream - A (ft)	56"
Downstream - B (ft)	156"
Upstream - A (duct diameters)	0.46
Downstream - B (duct diameters)	1.3

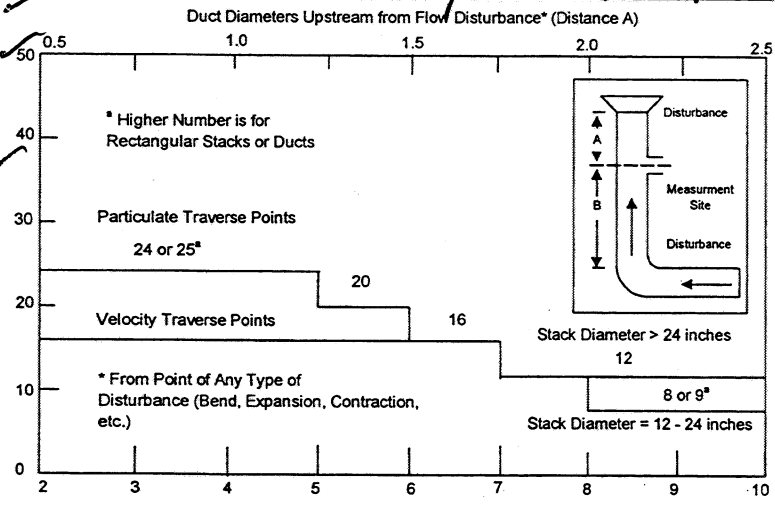
Diagram of Stack



2 x 114 x 132 / 114 + 132 = 122

Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	10	11 3/8	18" 29 3/8
2	30	34 1/4	~~64 1/4~~ 50 1/4
3	50	57"	73
4	70	79 7/8	95 7/8
5	90	102 5/8	~~121 5/8~~
6			118 5/8
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Determination of Stack Gas Velocity - Method 2

Client: OOE/MP
Location/Plant: Unit 2 Inlet
Source:
Operator: JLD
Date: 3-22-00
W.O. Number: 20009.011.00 b
Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 104.5
Pitot Tube/Thermo ID: P301

Run Number	1		
Time	1527		
Barometric Press, in Hg (Pb)	28.70		
Static Press, in H_20 (Pstatic)	-10.0		
Source Moisture, % (BWS)	10		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		Bott 1	1	0.49	368				
			2	0.43	363				
			3	0.45	366				
			4	0.40	363				
			5	0.29	356				
		2	1	0.42	370				
			2	0.40	369				
0.20	31		3	0.40	364				
			4	0.22	358				
			5	0.13	354				
~~0.20~~	~~25~~	3	1	0.41	359				
			2	0.39	360				
0.20	25		3	0.38	360				
			4	0.31	356				
			5	0.11	337	ACFM =		269000	
		4	1	0.37	354				
0.18	15		2	0.41	354	SCFM =		176000	
			3	0.42	354				
			4	0.41	350				
			5	0.22	347				
		Top 5	1	0.40	356				
			2	0.40	354				
0.25	20		3	0.42	353				
			4	0.36	348				
			5	0.37	348				
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$		.59348	357				
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

.290

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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Thimble 010

As = 104.5

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Page 1 of 2

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	IN
Run No.ID	~~2~~ 1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 Inlet
Sample Date	3/23/00
Baro. Press (in Hg)	28.70
Operator	mills

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		162.7
Silica gel (g)		14.1
CO2, % by Vol	13	13.0
O2, % by Vol	6	6.0
Temperature (°F)	360	
Meter Temp (°F)	85	
Static Press (in H_2O)	-10	-11.0
Ambient Temp (°F)	60	

Meter Box ID	WC 9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	14
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.275
Area of Stack (ft^2)	104.5
Sample Time	135
Total Traverse Pts	25

K Factor 3.58

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.005		.006
Leak Check @ (in Hg)	15		14
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	60	68
Reference Temp	60	68
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	~~1230~~			743.163									
A	5	1245	0.38	1.32	746.2	342	78	73	256	252	48	4		
	10		0.35	1.21	749.2	346	84	76	250	253	46	4		
	15		0.35	1.21	752.2	347	87	76	245	253	45	4		
	20		0.28	0.98	755.0	350	90	78	242	252	45	4		
	25	1310	0.24	0.83	757.589	342	90	79	240	249	45	4		
					14.426					Leak check Good @ 7 in Hg				
B	0	1316	—	—	757.786	—	—	—	—	—	—	—		
	5		0.39	1.35	761.1	347	87	82	246	252	48	5		
	10		0.42	1.50	764.3	352	91	82	242	252	46	5		
	15		0.37	1.32	767.4	352	92	83	240	251	45	5		
	20		0.26	0.93	770.1	349	94	84	252	251	43	5		
	25	1341	0.14	0.50	772.106	337	94	85	248	251	47	4		
					14.320					Leak check Good @ 12				
C	0	1343	—	—	772.243	—	—	—	—	—	—	—		
	5		0.39	1.35	775.4	342	92	86	247	251	48	6		
	10		0.39	1.35	778.7	360	96	87	250	251	47	6		
	15		0.40	1.43	781.9	360	96	87	247	252	47	6		
	20		0.32	1.14	785.2	358	97	89	245	251	47	6		
	25	1408	0.16	0.57	787.095	347	97	89	243	251	49	5		
					14.882					Leak check Good @ 12				
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

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Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE | Operator: Mills
Source: UNIT 2 | Run No.:
Sample Loc.: Inlet | Date: 3/23/00 | K Factor: 3.58 / Exit Heated

IN STACK THIMBLE

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1416			787.105									
B	5		0.41	1.47	790.4	350	93	90	241	249	52	7		
B	10		0.43	1.54	793.9	363	95	90	238	252	51	7		
	15		0.38	1.36	797.0	364	97	90	239	252	49	7		
	20		0.38	1.36	800.1	362	98	90	241	252	50	7		
	25	1441	0.24	0.86	802.909	358	98	91	242	251	51	6		
					15.804						leak	check - good @ Pm		
A	0	1443	—	—	803.013	—	—	—	—	—	—	—		
	5		0.38	1.36	806.3	355	95	90	247	252	52	7		
	10		0.45	1.62	809.7	367	97	90	248	251	52	8		
	15		0.37	1.33	812.9	368	97	90	247	251	51	8		
	20		0.37	1.33	816.2	368	97	91	247	250	52	8		
	25	1508	0.32	1.15	819.624	362	98	90	248	251	53	8		
					16.611									
											Iso =		105.6	
											qm =		10.5	
											scfm =		141600.	
											Um =		70.79	
													2.00 m³	
			.580764											
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			0.5808	1.2148	76.043	353.9	87.4		347/353	53	8			
				Avg Sqrt Del H	Comments:									
				1.0932			89.4							

JRO

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As = 104.5

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	IN
Run No.ID	2-2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 , Inlet
Sample Date	3/24/00
Baro. Press (in Hg)	28.29
Operator	M. Hill

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		177.3
Silica gel (g)		14.3
CO2, % by Vol	13	13.13
O2, % by Vol	6	6.67
Temperature (°F)	360	
Meter Temp (°F)	75	
Static Press (in H_2O)	-11	-11.4
Ambient Temp (°F)	55	

Meter Box ID	WC9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	12
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.275
Area of Stack (ft^2)	104.5
Sample Time	125
Total Traverse Pts	25

K Factor 3.47

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.004		.004
Leak Check @ (in Hg)	15		15
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	55	55
Reference Temp	55	55
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0820			821.178									
E	5		0.43	1.50	824.5	342	68	61	237	251	47	5.0		
	10		0.45	1.56	828.3	345	70	62	242	251	46	5.0		
	15		0.42	1.45	831.2	354	77	65	248	251	44	5.0		
	20		0.40	1.39	834.4	342	77	65	242	251	42	5.0		
	25	0845	0.27	0.94	837.074	339	79	67	258	251	41	4.0		
					15.896						Leak check Good @ 9			
D	0	0850	—	—	837.168	—	—	—	—	—	—	—		
	5		0.48	1.66	840.7	340	76	69	257	251	43	6.0		
	10		0.51	1.77	844.6	343	80	70	260	251	42	6.0		
	15		0.50	1.73	847.9	343	83	72	249	251	41	7.0		
	20		0.30	1.04	850.6	342	83	72	245	251	41	5.5		
	25	0915	0.21	0.73	853.160	337	84	74	239	251	41	5.0		
					15.992						Leak check Good @ 9			
C	0	0919	—	—	853.268	—	—	—	—	—	—	—		
	5		0.47	1.63	856.7	336	79	73	247	251	43	7.0		
	10		0.52	1.80	860.3	342	83	75	246	251	42	8.0		
	15		0.45	1.56	863.7	343	85	75	240	251	41	7.5		
	20		0.40	1.39	867.1	342	86	76	239	251	41	7.5		
	25	0944	0.21	0.73	869.535	340	87	76	238	251	43	6.0		
					~~16.085~~						Leak check Good @ 10			
					16.267									
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:						Ontario Hydro Method			

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25
5
125

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE | Operator: Mills
Source: UNIT 2 | Run No.: 5,2
Sample Loc.: Inlet | Date: 7/24/00 | K Factor: 3.47 Heated

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0948			869.633									
B	5		0.50	1.73	873.3	342	82	77	249	251	44	8.5		
B	10		0.48	1.66	876.6	344	86	78	244	251	44	9		
	15		0.53	1.84	880.1	352	87	78	241	251	43	10		
	20		0.50	1.73	884.3	347	87	78	239	251	44	10		
	25	1013	0.30	1.04	886.909	337	88	79	237	251	44	9		
					17.276									
	0	1015	—	—	887.013	—	—	—	—	—	—	—		
A	5		0.49	1.70	890.4	339	83	79	246	251	45	10		
A	10		0.49	1.70	894.0	351	87	79	245	251	46	10		
	15		0.51	1.77	897.7	350	87	79	245	251	45	11		
	20		0.45	1.56	901.2	346	88	80	244	251	44	11		
	25	1040	0.37	1.28	904.535	337	88	80	240	251	45	10		
					17.522									
													%I =	99.4
													%m =	10.4
													158000	SCFM
													Vm std =	77.46
														2.19 m³
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			.64763	1.4756	~~82.771~~ 82.593	343.0	78.0	337/360	251/251	47	11			
				Avg Sqrt Del H	Comments:									
				1.20578										

✓ Hot

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Page 1 of 2

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	IN
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 Inlet
Sample Date	3/24/00
Baro. Press (in Hg)	28.20
Operator	Mills

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		187.4
Silica gel (g)		16.1
CO2, % by Vol	13	13.4
O2, % by Vol	6	6.4
Temperature (°F)	360	
Meter Temp (°F)	85	
Static Press (in H_2O)	-11.5	-11.5
Ambient Temp (°F)	55	

Meter Box ID	WC 9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	12
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	[illegible]
Pitot Coefficient	0.84
Nozzle ID	.275
Avg Nozzle Dia (in)	.275
Area of Stack (ft^2)	104.5
Sample Time	125
Total Traverse Pts	25

K Factor 3.57

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.005		.004
Leak Check @ (in Hg)	15		13
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	56	55
Reference Temp	56	55
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1230			904.550									
	5		0.38	1.32	908.3	336	82	77	251	251	43	4		
E	10		0.40	1.39	911.6	349	84	78	257	252	42	4		
	15		0.45	1.56	914.9	346	87	79	260	251	41	5		
	20		0.38	1.32	918.2	346	88	79	265	251	40	5		
	25	1255	0.19	0.66	920.588	341	89	80	262	251	40	4		
					15.638					Leak check	Good @	9		
D	0	1259	—	—	920.675	—	—	—	—	—	—	—		
	5		0.45	1.56	924.1	343	85	80	259	251	41	6		
	10		0.48	1.66	927.9	351	89	81	249	251	41	6		
	15		0.40	1.43	931.0	348	89	81	249	251	40	6		
	20		0.30	1.07	934.0	345	89	81	252	251	40	5		
	25	1324	0.17	0.61	936.297	337	88	81	256	251	41	4		
					15.622					Leak check	Good @	12		
	0		—	—	936.415	—	—	—	—	—	—	—		
C	5	1326	0.39	1.39	939.7	339	86	81	256	251	40	6		
	10		0.46	1.64	943.1	350	90	81	260	251	41	6.5		
	15		0.38	1.36	946.2	351	89	81	261	251	41	6		
	20		0.34	1.21	949.4	349	89	81	257	251	41	6		
	25	1351	0.20	0.71	951.814	339	89	81	260	251	41	5		
		1401								Leak check	Good @	10		
					15.399									
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	~~Max Temp~~	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

A

Warehouse

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 2
Sample Loc.: Inlet
Operator: Mills
Run No.: 3
Date: 3/24/00
K Factor: 3.57
Heated

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	COMMENTS
	0	1353			951.920								
B	5	0.38	~~0.38~~	1.35	955.0	376	87	81	253	251	42	6.5	
	10	~~0.47~~	0.471	1.68	958.7	351	88	81	249	251	42	7.5	
	15		0.46	1.64	962.2	353	89	81	245	251	42	8	
	20		0.43	1.53	965.8	352	89	81	244	251	42	8	
	25	1418	0.31	1.10	968.790	349	90	81	245	251	44	7	
					16.87					Leak Check Good @ 12			
	0	1420	—	1.71	968.910	—	—	—	—	—	—	—	
A	5		0.48	~~1.53~~	972.3	350	88	81	250	251	43	9	
	10		0.46	1.64	975.0	354	90	81	245	251	43	9	
	15		0.48	1.71	979.4	357	90	81	241	252	43	9.5	
	20		0.43	1.53	983.0	354	90	82	244	251	44	10	
	25	1445	0.32	1.14	986.064	344	90	81	240	251	45	8.5	
					17.154								

%I = 102.3
%M = 11.4
147900 scfm
Vm = 74.6 2.11 m³

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.64229	~~1.377~~ 1.3568	30.683	347.1	~~83.74~~ 84.3	240/265	251/252	45	10	

Avg Sqrt Del H: 1.15521

Comments:

CK. RER.

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Location: UNIT ~~4~~ 2 Inlet

Run No. 1 | Sample Date 3/23/00 | Recovery Date 3/23/00

Sample I.D. MPBW - U~~4~~ 2 - IN - 1 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thim Number 10

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	848.7	642.6	723.1	752.4	724.2	711.8	710.5		980.5	
Initial	727.3 100	614.8 100	717.6 100	747.2 100	723.9 100	710.3 100	709.5 100	4950.6	966.4 300	5917.0
Gain	121.4	27.8	5.5	5.2	0.30	1.5	1.0	162.7	14.1	176.8

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: 1/5 pinll | Sealed? ✓

Run No. 2 | Sample Date 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U~~4~~ 2 - IN - 2 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thim Number #12

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	841.0	735.7	730.4	748.8	735.6	761.8	733.3		973.1	
Initial	716.3 100	700.7 100	721.7 100	742.9 100	733.7 100	760.9 100	733.1 100		958.8 300	
Gain	124.7	35	8.7	5.9	1.9	0.9	0.2	177.3	14.3	191.6

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: | Sealed? ✓

Run No. 3 | Sample Date 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U~~4~~ 2 - IN - 3 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thim Number #15

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	922.5	663.0	647.0	666.1	741.5	708.7	728.2		876.4	
Initial	695.3 100	624.5 100	637.4 100	659.2 100	739.3 100	707.3 100	726.6 100		860.3 300	
Gain	~~127.2~~ ~~227.2~~	38.5	9.6	6.9	2.2	1.4	1.6	187.4	16.1	203.5

Impinger Color: | Labeled? ✓

Silica Gel Condition: | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Loaction: UNIT 2 Inlet

Run No. BT | Sample Date ~~3/23/00~~ 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U2 - IN - BT - OHM - 20MAR2000 | Analyst EERC | Filter Number 13

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	742.6	725.1	747.5	705.1	732.2	701.9	725.6		872.3	
Initial	741.9 100	725.1 100	747.5 100	705.2 100	732.2 100	701.9 100	725.6 100	5079.4	872.9 300	5952.3
Gain	.7	0	0		0	0	0			

Impinger Color: ~~blue~~ all clear | Labeled? ✓

Silica Gel Condition: blue | Sealed? ✓

Run No. ___ | Sample Date ___ | Recovery Date ___

Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ | Labeled? ___

Silica Gel Condition ___ | Sealed? ___

Run No. ___ | Sample Date ___ | Recovery Date ___

Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ | Labeled? ___

Silica Gel Condition ___ | Sealed? ___

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Source Gas Analysis Data Sheet - Method 3

Client DOE

Analyst [illegible]

Location/Plant Boswell

Date 3-23-00

Source Unit 2 Inlet

Analytical Method (circle one) ORSAT

W.O. Number

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.6	19.6	6.0	
2		13.6	19.6	6.0	
3		13.6	19.6	6.0	
	Average	13.6		6.0	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.2	19.8	6.6	
2		13.0	19.8	6.8	
3		13.2	19.8	6.6	
	Average	13.13		6.67	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.4	19.8	6.4	
2		13.4	19.8	6.4	
3		13.4	19.8	6.4	
	Average	13.4		6.4	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.8

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

WESTON MANAGERS DESIGNERS/CONSULTANTS

Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client DOE/MP
Loaction/Plant Unit 2 Outlet
Source

Operator Allmendinger
Date 3/22/00
W.O. Number 20009-011.001.

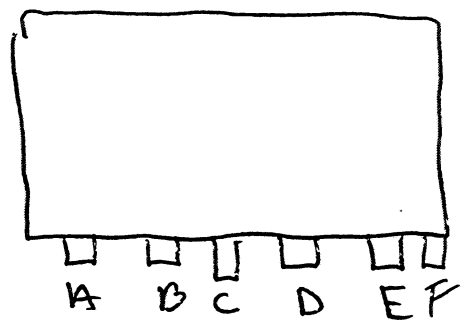
Duct Type	☐ Circular	☒ Rectangular Duct	Indicate appropriate type	1101
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse		

Distance from far wall to outside of port (in.) = C	136"
Port Depth (in.) = D	16"
Depth of Duct, diameter (in.) = C-D	120"
Area of Duct (ft^2)	100
Total Traverse Points	25
Total Traverse Points per Port	5

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	10 x 10
Total Ports (rectangular duct only)	6

Flow Disturbances	
Upstream - A (ft)	20'
Downstream - B (ft)	55'
Upstream - A (duct diameters)	2
Downstream - B (duct diameters)	5.5

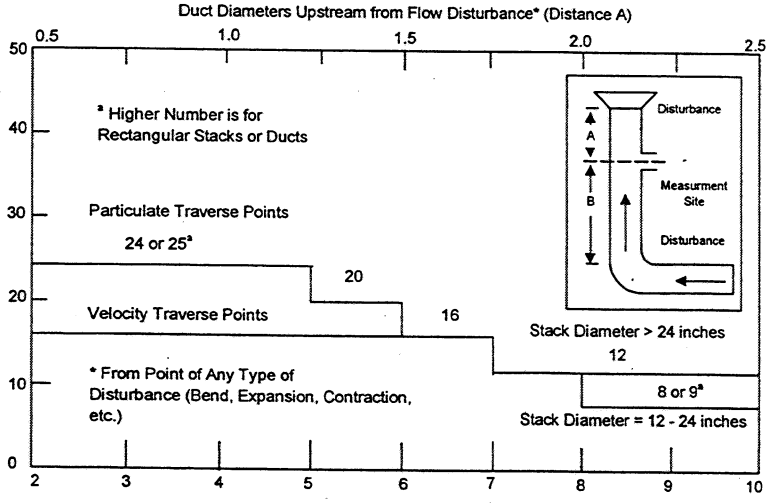
Diagram of Stack



ABD
E = 16"
C = 20"

Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	10	12	16" 28
2	30	36	52
3	50	60	76
4	70	84	100
5	90	108	124
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client: DOE
Operator: SDO
Loaction/Plant: Boswell
Date: 3/22/0
Source: Unit 2 Outlow Recirculation fan
W.O. Number:

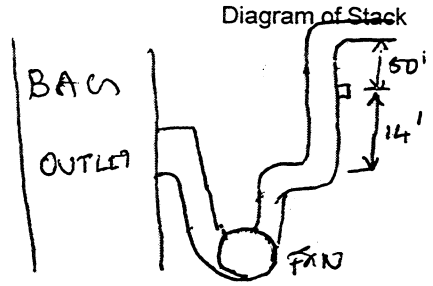
Duct Type	☐ Circular	☑ Rectangular Duct	Indicate appropriate type
Traverse Type	☐ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	38
Port Depth (in.) = D	12
Depth of Duct, diameter (in.) = C-D	24"
Area of Duct (ft^2)	11.2
Total Traverse Points	24
Total Traverse Points per Port	4

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	67
Total Ports (rectangular duct only)	6

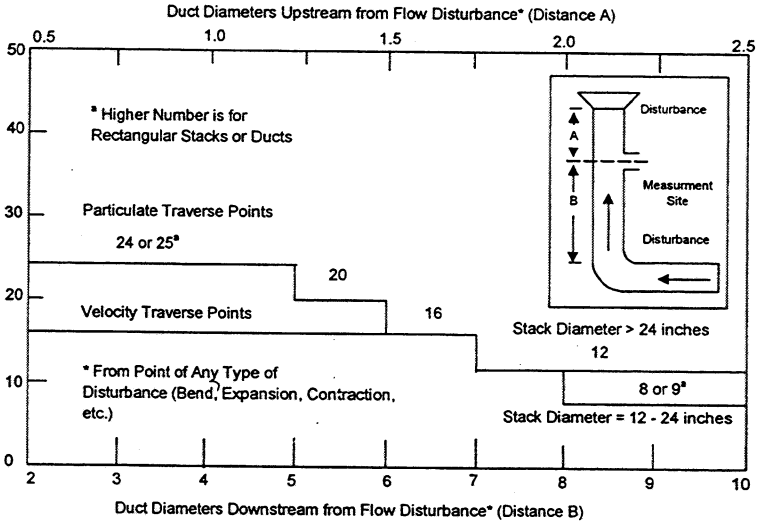
Flow Disturbances	
Upstream - A (ft)	50'
Downstream - B (ft)	14'
Upstream - A (duct diameters)	~ 16.97
Downstream - B (duct diameters)	~ 9.91

Diagram of Stack 6 ports



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.125	3"	15"
2	.375	9"	21"
3	.625	15"	27"
4	.875	~~10.5~~ 21"	33"
5			
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Determination of Stack Gas Velocity - Method 2

Client: DOE
Location/Plant: Boscwell
Source: Unit 2 stack

Operator: KA
Date: 3-22-00
W.O. Number:

Pitot Coeff (Cp): .84
Stack Area, ft² (As): 100
Pitot Tube/Thermo ID: P305

Run Number	1		
Time			
Barometric Press, in Hg (Pb)	28.7		
Static Press, in H_2O (Pstatic)	-16		
Source Moisture, % (BWS)	9.4		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		E	1	.31	348	.58	335		
0.0	0		2	.29	348	.55	333		
			3	.27	345	.52	335		
			4	.31	345	.50			
0.005	1		5	.38	340	.45	341		
		D	1	.68	339				
			2	.44	348				
~~-~~0.01	2		3	.37	341				
			4	.31	342				
			5	.35	343				
		C	1	.41	345				
			2	.43	345				
			3	.40	338	280300	ACFM		
			4	.41	340				
0.0	1		5	.43	342	152900	SCFM		
		B	1	.44					
			2	.45					
			3	.41					
			4	.37					
0.0	1		5	.42					
		A	1	.44					
			2	.50					
			3	.47		Ave ΔP = 0.43			
0.0	0		4	.42	335				
			5	.45	336				
Avg Angle		Avg Delta P & Temp				~~.8773~~	341		
		avg √DeltaP				.6488			
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

.275

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments _____

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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Determination of Stack Gas Velocity - Method 2

Client: DOE MP
Location/Plant:
Source: Unit 2 Baghouse Recirc.
Operator: KA/JP
Date: 3/23/00
W.O. Number:
Pitot Coeff (Cp): .840
Stack Area, ft² (As): 10
Pitot Tube/Thermo ID: P139

Run Number	TWO		
Time	1530		
Barometric Press, in Hg (Pb)	28.7		
Static Press, in H_20 (Pstatic)	-8.		
Source Moisture, % (BWS)	10		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		P	1	-.0					
			2	-.0					
			3	-.0					
			4	-.0					
			5	-.0					
			~~6~~						
		2	1	.14					
			2	.13					
			3	.01					
			4	-.0					
			5	-.0					
			~~6~~						
		3	1	.0					
			2	.0					
			3	-.0					
			4	-.0					
			5	-.0					
			~~6~~						
		4	1	.04					
			2	.01					
			3	-.0					
			4	.14					
			5	.05					
			~~6~~						
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$							
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

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Determination of Moisture Content in Stack Gases - Method 4

Client DOE
Location/Plant Boswell
Source Unit 2 Out
W.O. Number _____

Operator JA
Meter Box ID 7
Temperature °C or °F °F

Date 3-22-00
Meter Box Y .8958
Sample Volume, ft³ or L ft³

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1										Initial _____
	End Test	1649	999.658	77 / 74	68 / 66	2.0	240	307.1		Final _____
Baro Press., Pb (in Hg)	Start Test	1619	977.393	72 / 63	65 / 62	2.0	200	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
28.7	Avg. or Total	30	22.265	68.4		2.0	40	7.1		9.4

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial _____
	End Test									Final _____
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial _____
	End Test									Final _____
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)} \right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percen

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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Thimble 009

Dso = 100

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	OUT
Run No.ID	1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 Outlet
Sample Date	3/23/00
Baro. Press (in Hg)	28.70
Operator	JP/KA/PH

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		160.3
Silica gel (g)		17.1
CO2, % by Vol	13	13.0
O2, % by Vol	6	6.6
Temperature (°F)	337	
Meter Temp (°F)	60	
Static Press (in H_2O)	-16	-19
Ambient Temp (°F)	47	

Meter Box ID	7
Meter Box Y	.99576
Meter Box Del H	1.87466
Probe ID / Length	12'
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	.270
Avg Nozzle Dia (in)	.270
Area of Stack (ft^2)	2.73 ft² 100
Sample Time	120
Total Traverse Pts	30

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.010		.010
Leak Check @ (in Hg)	15		10
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	66	67
Reference Temp	65	67
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1245			~~013.209~~									
	4		.45	1.38	16.0	315	66	65	235	250	62	6.0		K 23.08
	8		.32	.98	18.2	332	68	66	228	250	63	6.0		
	12		.29	.89	20.3	332	69	65	228	248	61	6.0		
	16		.31	.99	22.8	333	71	66	228	260	61	6.0		K 23.20
	20	1305	.46	1.47	25.262	333	72	67	228	255	59	7.5		
							L-C good @ 10 in Hg							11.921
E	0	1308	.43		25.352									
	4		~~.43~~ .38	1.37	27.9	325	72	68	228	254	61	7.0		
	8		.38	1.21	30.4	334	73	69	228	256	61	7.0		
	12		.35	1.12	32.9	335	75	69	228	253	61	6.5		K 23.23
	16		.33	1.06	35.3	335	76	70	228	255	61	6.5		~~K 23.23~~
	20	1328	.47	1.52	38.125	334	76	71	228	255	62	7.5		12.773
							L-C good @ 10 in Hg							
D	0	1332			38.195									
	4		.41	1.32	42.7	330	75	71	229	259	63	7.0		
	8		.40	1.29	43.3	337	75	71	228	258	64	7.0		
	12		.35	1.13	45.7	338	77	72	228	257	64	6.5		
	16		.36	1.16	48.1	338	78	72	228	254	64	6.0		
	20	1352	.41	1.32	50.718	326	77	72	228	254	64	6.5		12.523
							L-C good @ 10 in Hg							
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max ~~228~~ 229	Min/Max ~~229~~ 228	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:						Ontario Hydro Method			

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 2
Sample Loc.: Outlet
Operator: J.P
Run No.: 1
Date: 3/23/00
K Factor: 3.23

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1402			50.775									
	4		.43	1.39	53.4	330	75	73	228	253	65	7.0		
	8		.44	1.42	55.7	333	76	72	228	256	66	7.0		
	12		.46	1.48	58.3	342	77	73	228	255	64	7.0		
	16		.30	.97	60.4	341	77	73	228	258	62	6.0		
	20	1422	.37	1.19	62.943	330	78	74	228	255	62	6.0		12.168
							L.C good @ 10in Hg							
B	0	1424			63.010									
	4		.44	1.42	65.5	330	77	74	247	255	63	7.0		
	8		.5	1.61	68.3	345	78	74	248	255	61	7.0		
	12		.44	1.42	71.0	345	78	74	249	256	60	7.0		
	16		.37	1.19	73.4	344	78	74	246	255	59	6.0		
	20	1444	.44	1.42	76.158	338	78	74	248	254	59	7.0		13.148
							L.C good @ 10in Hg							
A	0	1447			76.232									
	4		.46	1.49	78.6	320	76	73	250	253	61	6.0		
	8		.50	1.61	81.5	347	76	73	248	255	62	7.0		
	12		.44	1.42	84.2	348	77	73	247	255	60	7.0		
	16		.46	1.48	86.9	349	77	73	246	254	60	7.0		
	20	1507	.40	1.29	89.544	345	78	73	248	254	61	7.0		13.312
											%Iso =	101.5		
											%moisture =	10.4		
											SCFM =	149000		
	120												71.95	= 2.04
			Avg Sqrt Delta P: 0.6352	Avg Delta H: 1.3003	Total Volume: 75.845	Avg Ts: 335.8	Avg Tm: 73.2	Min/Max: 228/250	Min/Max: 237/260	Max Temp: 66	Max Vac: 7.5	Max Temp: —		
				Avg Sqrt Del H: 1.1370	Comments:									

✓ NBA

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ISOKINETIC FIELD DATA SHEET ~~172.6~~ Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	OUT
Run No.ID	~~1~~ 2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 Outlet
Sample Date	3/24/00
Baro. Press (in Hg)	28.26
Operator	JP/KA/PU

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		150.9
Silica gel (g)		14.3
CO2, % by Vol	13	12.6
O2, % by Vol	6	7.2
Temperature (°F)	~~340~~ 335	
Meter Temp (°F)	60	
Static Press (in H_2O)	-18	-18
Ambient Temp (°F)	58	

Meter Box ID	87
Meter Box Y	.9957
Meter Box Del H	1.8746
Probe ID / Length	12'
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	.270
Avg Nozzle Dia (in)	.270
Area of Stack (ft^2)	100
Sample Time	120
Total Traverse Pts	30

K Factor	Initial	Mid-Point	Final
Leak Checks			
Sample Train (ft^3)	.010		.0008
Leak Check @ (in Hg)	15		16
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	54	55
Reference Temp	54	56
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0821			92.678									
	4		.29	.91	94.291/5	321 325	60	57	260	260	56	5.0		K 23.14
	8		.24	.75	97.9	332	60	57	260	258	54	4.5		stop @ 923
	12		.28	.87	100.3	333	60	57	255	260	54	4.5		start @ 929
	16		.28	.87	102.5	333	60	57	252	260	53	4.5		
	20	0845	~~.36~~ .36	~~.94~~ 1.13	105.075	326	62	58	248	263	53	4.5		11.367
E	0	0849			105.131			L.C	good @ 8 in Hg					
	4		.40	1.26	107.2	330	62	58	249	260	52	5.0		
	8		.35	1.09	109.6	331	62	58	249	258	52	5.0		
	12		.35	1.09	112.1	332	64	59	249	261	52	5.0		
	16		.33	1.03	114.4	332	64	59	248	262	52	5.0		
	20	0909	.45 4.25	1.3~~2~~41	117.106	330	65	60	247	260	52	5.0		11.975
D	0	0912			117.185			L.C	good @ 8 in Hg					
	4		.39	1.22	119.5	330	63	60	248	262	53	5.0		
	8		.37	1.16	122.0	333	64	60	247	264	53	5.0		
	12		.35	1.11	122.0	332	64	60	248	264	52	5.0		K 23.17
	16		.35	1.11	123.2	330	65	60	247	264	52	5.0		
	20	0932	.39	1.24	124.631	328	66	61	248	261	52	5.0		12.446
								L.C	good @ 8 in Hg					
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client: DOE | Operator: JP/RA/Dn
Source: UNIT 2 | Run No.: 2
Sample Loc.: Outlet | Date: 3/26/00 | K Factor: 3.17

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0934			129.675									
	4		.41	1.3	132.2	330	65	61	247	263	53	5.0		
	8		.41	1.3	134.8	330	65	61	248	262	55	5.0		
	12		.37	1.17	137.2	332	65	61	248	262	53	5.0		
	16		.33	1.05	139.7	332	66	61	245	261	53	5.0		
	20	0952	.45	1.43	142.342	330	66	61	247	260	54	5.0		12.667
							L-C speed @ 10 min							
B	0	0952			142.342									
	4		.47	1.49	144.7	330	65	61	245	264	55	5.0		
	8		.47	1.49	147.6	333	65	61	246	264	55	5.0		
	12		.45	1.43	150.1	333	66	61	247	264	54	5.0		
	16		.36	1.14	152.9	333	67	61	248	262	54	5.0		
	20	1016	.36	1.14	155.459	328	67	62	248	261	55	5.0		13.077
							L-C speed @ 10 in Hg							
A	0	1018	.45		155.596									
	4		~~.46~~	1.55	157.8	330	66	61	248	263	55	5.0		
	8		.43	1.36	160.8	335	66	61	247	263	52	5.0		
	12		.43	1.36	163.5	335	66	61	247	263	52	5.0		
	16		.43	1.36	166.1	335	67	62	247	264	54	5.0		
	20	1038	.35	1.10	168.601	330	68	62	257	263	54	5.0		13.005
											% O2		104.6	
											% m_2		11.0	
													142400 SCFM	
													71.07 $V_m std$ = 2.01 m^3	
			Avg Sqrt Delta P: 0.6141	Avg Delta H: 1.19733 ~~1.09037~~	Total Volume: 74.537	Avg Ts: 331.1	Avg Tm: 62.2	Min/Max: 247/260	Min/Max: 258/264	Max Temp: 56	Max Vac: 5	Max Temp		
				Avg Sqrt Del H: 1.09037	Comments:									

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Thimble #14

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U2
Samp. Loc. ID	OUT
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 2 Outlet
Sample Date	3/24/00
Baro. Press (in Hg)	~~28.62~~ 28.20
Operator	JP/RA/DM

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		174.8
Silica gel (g)		15.5
CO2, % by Vol	13	12.73
O2, % by Vol	6	7.07
Temperature (°F)	333	
Meter Temp (°F)	62	
Static Press (in H_2O)	-13	-19
Ambient Temp (°F)	56	

Meter Box ID	7
Meter Box Y	0.99576
Meter Box Del H	1.87466
Probe ID / Length	12
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	.270
Avg Nozzle Dia (in)	.270
Area of Stack (ft²)	100
Sample Time	120
Total Traverse Pts	30

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	.010		.004
Leak Check @ (in Hg)	15		8
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	54	60
Reference Temp	54	59
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	~~yes~~ / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (In H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1230			169.258									
E	4		.42	1.33	171.9	330	60	59	252	260	59	5.5		1623.17
	8		.25	.79	174.1	335	60	59	252	260	59	5.0		
	12		.26	.82	176.1	336	62	59	254	261	57	5.0		
	16		.30	.95	178.4	336	64	60	255	263	55	5.0		
	20	1250	.36	1.14	180.838	330	65	61	258	261	54	5.0		11.580
					11.58									
					~~180.891~~		L.C good @ 10 in Hg							
E	0	1252			180.891									
	4		.41	1.3	183.4	330	65	61	251	261	53	5.0		
	8		.38	1.2	186.1	338	66	61	252	264	52	5.0		
	12		.29	.92	188.2	337	66	62	250	264	52	5.0		
	16		.28	.88	190.4	337	66	62	252	263	52	5.0		
	20	1312	.37	1.17	192.840	335	66	62	251	263	53	5.0		11.949
					11.949									
							L.C good @ 10 in Hg							
D	0	1314			192.989									
	4		.37	1.17	195.4	330	65	62	251	262	54	5.0		
	8		.37	1.17	197.8	337	65	62	252	264	53	5.0		
	12		.33	1.04	200.2	337	66	62	253	262	53	5.0		
	16		.33	1.04	202.6	336	66	62	254	263	52	5.0		
	20	1334	.37	1.24	205.144	330	66	62	253	263	52	5.0		12.155
					12.155									
							L.C good @ 10 in Hg							
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET — Ontario Hydro Method - Mercury

Client: DOE | Operator: JP/KA/PM
Source: UNIT 2 | Run No.: 3
Sample Loc.: Outlet | Date: 3/28/00 | K Factor: 3.17

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1339			~~205.798~~									
C	4		.41	1.3	207.8	330	64	62	260	262	54	5.0		
	8		.42	1.33	210.3	337	65	62	260	262	53	5.0		
	12		.37	1.17	213.0	337	66	62	261	263	53	5.0		
	16		.35	1.11	215.4	336	66	62	260	261	52	5.0		
	20	1359	.36	1.14	217.665	332	66	62	266	261	52	5.0		12.467
					~~11.867~~									
							L.C good @ 10 in Hg							
B	0	1401			217.716									
	4		.45	1.43	220.2	330	66	63	261	263	55	5.0		
	8		.47	1.5	223.0	338	66	63	261	262	54	5.0		K=3.18
	12		.40	1.27	225.6	338	67	63	261	264	53	5.0		
	16		.37	1.18	228.9	338	67	63	261	262	53	5.0		
	20	1421	.36	1.15	230.570	333	68	63	261	263	53	5.0		12.854
					12.854									
							L.C good @ 10 in Hg							
A	0	1424			230.625									
	4		.49	1.56	233.2	332	67	63	261	262	54	5.5		
	8		.44	1.39	235.8	340	68	64	260	263	55	5.5		
	12		.46	1.46	238.6	341	69	64	260	263	55	5.5		
	16		.47	1.5	241.4	340	69	64	261	263	55	5.5		
	20	1444	.33	1.05	243.759	338	69	64	260	263	55	5.5		
					13.134									
												%I	104.2	
												SCFM	140.400	
												%M	11.4	
			.60997		74.139								69.73 Vm	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			.61043	1.190	73.539	335.1	63.9		250/266	260/263	59	5.5		
				Avg Sqrt Del H	Comments:									
				1.086972										

= 1.97

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Location: UNIT ~~1~~ 2 Outlet

Run No. 1 2 | Sample Date 3/23/00 | Recovery Date 3/23/00

Sample I.D. MPBW - U~~4~~ - OUT - 1 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thim Number 9

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	830.7	723.2	728.0	740.1	710.5	711.9	714.5	5158.9	872.9	
Initial	713.7 100	696.7 100	719.5 100	734.4 100	708.9 100	711.8 100	713.6 100	4998.6	855.8 300	5854.4
Gain	117	26.5	8.5	5.7	1.6	0.1	0.9	160.3	17.1	177.4

Impinger Color: all clear except kmnO4 | Labeled? ✓

Silica Gel Condition: 1/4 lt blue, rest good | Sealed? ✓

Run No. 2 2 | Sample Date 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U~~4~~ - OUT - 2 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thimb Number #11 (Thimb)

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	867.6	746.6	730.7	720.4	737.4	732.8	639.8		924.1	
Initial	744.3 100	718.4 100	724.6 100	716.4 100	736.0 100	732.5 100	639.5 100		909.8 300	
Gain	~~132.3~~ 123.3	28.2	6.1	4.0	1.4	0.3	0.3	~~172.6~~ 163.6	14.3	~~186.9~~ 177.9

Impinger Color: All clear except kmnO4 | Labeled? ✓

Silica Gel Condition: good | Sealed? ✓

Run No. 3 2 | Sample Date 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U~~4~~ - OUT - 3 - OHM - 20MAR2000 | Analyst EERC | ~~Filter~~ Thimb Number #14 (Th.)

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	810.7	751.5	708.7	660.8	733.3	602.2	724.1		964.4	
Initial	694.4 100	711.4 100	697.0 100	656.3 100	732.2 100	602.1 100	723.1 100		948.9 300	
Gain	116.3	40.1	11.7	4.5	1.3	0.1	1.0	174.8	15.5	190.3

Impinger Color: All clear except kmnO4 | Labeled? ✓

Silica Gel Condition: Good | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Loaction: UNIT 2 Outlet

Run No. BT | Sample Date 3/24/00 | Recovery Date 3/24/00

Sample I.D. MPBW - U2 - OUT - BT - OHM - 20MAR2000 | Analyst EERC | Filter Number 16

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	629.6	728.4	596.9	737.5	707.2	751.5	603.7	4749.8	1008.4	5758.2
Initial	628.9 100	728.4 100	596.9 100	737.5 100	707.2 100	751.6 100	603.7 100		1008.4 300	
Gain	.7	0	0	0	0		0		0	

Impinger Color: ~~blue~~ all clear | Labeled? ✓

Silica Gel Condition: blue | Sealed? ✓

Run No. ___ | Sample Date ___ | Recovery Date ___

Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ | Labeled? ___

Silica Gel Condition ___ | Sealed? ___

Run No. ___ | Sample Date ___ | Recovery Date ___

Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ | Labeled? ___

Silica Gel Condition ___ | Sealed? ___

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Source Gas Analysis Data Sheet - Method 3

Client DoE

Analyst [illegible]

Location/Plant Bacwell

Date 3-23-00

Source Unit 2 outlet

Analytical Method (~~circle one~~) ORSAT

W.O. Number

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.0	19.6	6.6	
2		13.0	19.6	6.6	
3		13.0	19.6	6.6	
	Average	13.0		6.6	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		12.6	19.8	7.2	
2		12.6	19.8	7.2	
3		12.6	19.8	7.2	
	Average	12.6		7.2	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		12.8	19.8	7.0	
2		12.8	19.8	7.0	
3		12.6	19.8	7.2	
	Average	12.73		7.07	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

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Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client DOE
Loaction/Plant Boswell
Source unit #3 Inlet

Operator JM/LP.
Date 20 March 00

Duct Type	☐ Circular	☑ Rectangular Duct	Indicate appropriate type
Traverse Type	☐ Particulate Traverse	☑ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	128
Port Depth (in.) = D	7-55
Depth of Duct, diameter (in.) = C-D	121
Area of Duct (ft²) 121" x 114"	1149.5 #
Total Traverse Points	70
Total Traverse Points per Port	~~4~~ 5

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	114"
Total Ports (rectangular duct only)	

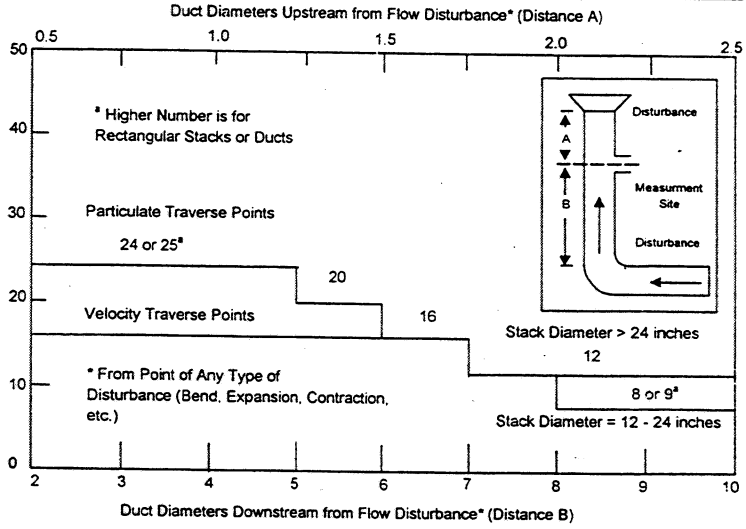
Flow Disturbances	
Upstream - A (ft)	
Downstream - B (ft)	
Upstream - A (duct diameters)	<1.0
Downstream - B (duct diameters)	<1.0

Diagram of Stack

114" wide

Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	10	12.1	19.1
2	30	36.3	43.3
3	50	60.5	67.5
4	70	84.7	91.7
5	90	108.7	115.7
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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SHEET ____ of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

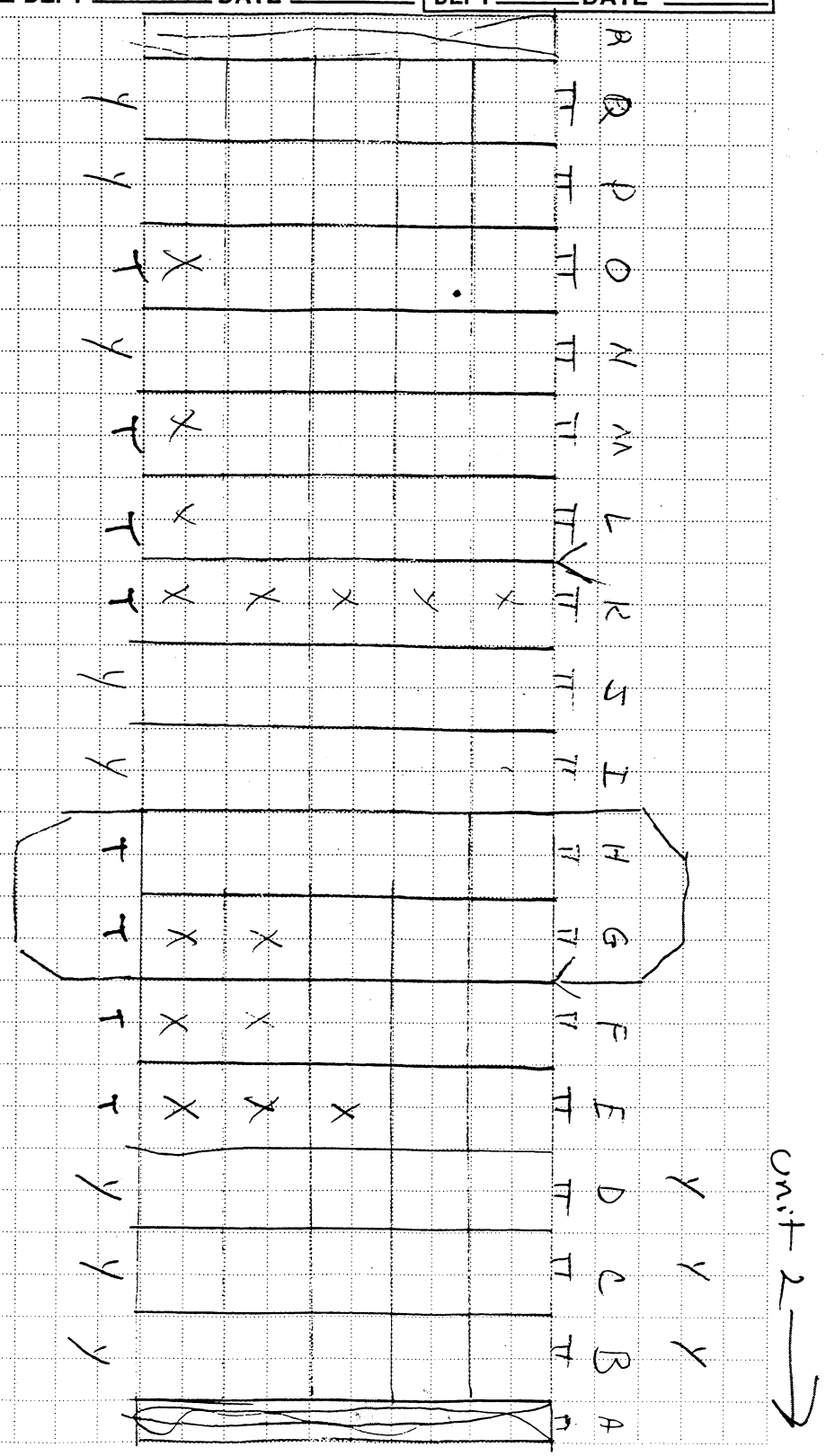
PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____



Flow is commings to wall 5/a

RFW 10-05-003/A-5/85
512-5643

Determination of Stack Gas Velocity - Method 2

Client: DOE
Location/Plant: Boswell
Source: #3 Scrubber Inlet
Operator: td 2
Date: 3-20-08
Pitot Tube/Thermo ID: P112
Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 1169.5

Run Number	1		
Time	1120		
Barometric Press, in Hg (Pb)	28.56		
Static Press, in H_2O (Pstatic)	-15		
Source Moisture, % (BWS)	29.54		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0	0	1	1	0.18	237				
			2	0.17	246				
			3	0.10	252				
			4	0.07	255				
			5	0.27	220				
		2	1	0.17	270				
			2	0.19	275				
			3	0.21	280				
			4	0.17	285				
0	0		5	0.16	264				
		3	1	0.12	245				
			2	0.21	279				
			3	0.23	276				
			4	0.23	275				
0	0		5	0.10	243				
		4	1	0.16	280				
			2	0.08	262				
			3	0.22	269				
			4	0.25	274				
0	0		5	0.15	235				
obstruct 0	0	5	1	0	293				
			2	0.15	300				
			3	0.08	297				
			4	0.04	287				
			5	0.18	255				
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$							
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wact/min									
Vol. flow rate at standard conditions, dscf/min									

n 5.9

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Determination of Stack Gas Velocity - Method 2

Client DOE
Location/Plant Boswell
Source #3 Scrubber Inlet

Operator [illegible]
Date 3-20-06
W.O. Number 20009-011-006-1100

Pitot Coeff (Cp) 0.84
Stack Area, ft² (As) 1149.5
Pitot Tube/Thermo ID 9112

Run Number	1		
Time			
Barometric Press, in Hg (Pb)			
Static Press, in H_2O (Pstatic)			
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at O°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		6	1	—					
			2	—					
			3	0.22	300				
			4	0.13	304				
0	0		5	0.17	265				
		7	1	0.20	310				
			2	0.20	307				
			3	0.09	305				
			4	0.10	289				
			5	0.12	282				
		8	1	0.22	297				
			2	0.27	280				
			3	0.26	290				
			4	0.24	268				
			5	0.28	259				
		9	1	0.17	245				
			2	0.27	245				
			3	0.23	243				
			4	0.22	247				
			5	0.30	233				
		(10(7))	1	—					
			2	—					
			3	~~0.0~~	226				
			4	0.03	226				
			5	0.00					

Avg Angle		Avg Delta P & Temp					
		avg $\sqrt{DeltaP}$					
		Average gas stream velocity, ft/sec.					
		Vol. flow rate @ actual conditions, wacf/min					
		Vol. flow rate at standard conditions, dscf/min					

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Determination of Stack Gas Velocity - Method 2

Client DOE
Location/Plant Boswell
Source #3 scrubber Inlet

Operator LDZ
Date 3-20-08
W.O. Number 20009.011.006.1106

Pitot Coeff (Cp) 0.84
Stack Area, ft² (As) 1149.5
Pitot Tube/Thermo ID 012

Run Number	1		
Time			
Barometric Press, in Hg (Pb)			
Static Press, in H_20 (Pstatic)			
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		(1 (6)	1	—					
			2	0.20	239				
			3	0.25	255				
			4	0.20	259				
			5	0.18	255				
		(2 (5)	1	—					
			2	0.03	253				
			3	0.13	254				
			4	0.11	265				
			5	0.07	260				
		(3 (2)	1	0.27	267				
			2	0.25	269				
			3	0.19	275				
			4	0.17	274				
			5	0.11	270				
		(4 (3)	1	—					
			2	0	268				
			3	0	271				
			4	0.12	280				
			5	0.09	280				
		(5 (2)	1	0.30	287				
			2	0.27	287				
			3	0.20	288				
			4	0.23	287				
			5	0.12	287				
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$							
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Determination of Stack Gas Velocity - Method 2

Client DOE
Location/Plant Boswell
Source #3 scrubber Inlet

Operator [illegible]
Date 3-20-00
W.O. Number 20009.011.006.1100

Pitot Coeff (Cp) 0.84
Stack Area, ft² (As) [illegible]
Pitot Tube/Thermo ID P112

Run Number			
Time			
Barometric Press, in Hg (Pb)			
Static Press, in H_20 (Pstatic)			
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at O°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		1 (A1)	1	0.15	280				
			2	0.15	283				
			3	0.11	283				
			4	0.09	282				
			5	0.08	281				
			End	1.26					
Avg Angle		Avg Delta P & Temp		0.1739	271				
		avg √DeltaP		0.4080					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Determination of Moisture Content in Stack Gases - Method 4

Client: DOE
Location/Plant: Boswell
Source: unit 3
Operator: tdz
Meter Box ID: WC-13
Temperature C° or F°: 221
Date: 3-20-00
Meter Box Y: 0.9926
Sample Volume, ft³ or L: 1 ft³

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1									21.9	Initial ✓
	End Test	1156	36.308	97	98	1.50	245	308.2		Final ✓ CK
Baro Press., Pb (in Hg)	Start Test	1120	12.254	88	87	1.50	200	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
28.56	Avg. or Total	36	24.054	92.5		1.50	45	8.2	2.6	10.3%

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH/13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percer

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	IN
Run No.ID	1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Inlet
Sample Date	3/21/00
Baro. Press (in Hg)	28.70
Operator	Mills/Fowler

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		133.6
Silica gel (g)		14.6
CO2, %' by Vol	14	14.6
O2, % by Vol	5	5.4
Temperature (°F)	280	
Meter Temp (°F)	90	
Static Press (in H_2O)	~~-15~~ -15	-14.8
Ambient Temp (°F)	90	

Meter Box ID	WC 13
Meter Box Y	0.9926
Meter Box Del H	1.9718
Probe ID / Length	10
Probe Material	Boro
Pitot / Thermocouple ID	P138
Pitot Coefficient	0.84
Nozzle ID	Boro .307
Avg Nozzle Dia (in)	.307
Area of Stack (ft^2)	1149.5
Sample Time	120
Total Traverse Pts.	40

K Factor 6.33

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.002		.004
Leak Check @ (in Hg)	15		9
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	91	94
Reference Temp	91	95
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	[illegible]			36.663									
Q 1	3		0.11	0.73	38.8	278	106	102	285	291	68	2	251	
2	6		0.06	0.40	39.9	280	107	102	280	294	65	1	251	
3	9		0.05	0.33	40.9	267	108	102	277	283	64	1	251	
4	12		0.09	0.60	42.5	259	108	102	277	280	64	1	251	
[illegible]	15	0917	0.20	1.30	43.742	250	109	103	270	275	61	2.5	251	
					7.079									
														Leak check Good @ 7 in Vac
	0	0924	—	—	43.800	—	—	—	—	—	—	—	—	
[illegible] 1	3		0.25	1.66	46.3	268	106	103	267	266	65	3.0	251	
2	6		0.21	1.39	47.8	286	109	104	274	268	62	3.0	251	
3	9		0.18	1.19	49.6	291	110	104	278	274	59	3.0	252	
4	12		0.10	0.63	51.1	283	109	104	279	278	59	3.0	251	
5	15	0939	0.22	1.46	52.852	274	109	104	280	287	59	4.0	251	
					7.052									
														Leak check Good @ 6
	0	0945	—	—	53.009	—	—	—	—	—	—	—	—	
N 1	3		0.14	0.93	54.7	275	107	104	272	293	66	4.0	251	
2	6		0.12	0.80	56.3	283	109	104	278	300	65	3.5	251	
3	9		0.12	0.80	57.9	290	109	104	283	296	63	3.5	251	
4	12		0.07	0.46	59.0	285	109	104	285	304	62	3.5	251	
5	15	1000	0.07	0.46	60.184	280	108	104	287	305	64	3.0	251	
					7.175									
														Leak Check Good @ 7
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Inlet
Operator: Mills
Run No.: 1
Date: 3/21/00
K Factor: 6.5

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1012			60.390									
S 1	3		0.17	1.10	68.3	~~254~~	106	104	277	290	68	4	251	
2	6		0.14	0.91	63.9	258	107	104	263	280	65	4	251	
3	9		0.12	0.78	65.5	264	108	104	265	278	64	4	251	
4	12		0.12	0.78	67.0	261	108	104	268	276	62	4	251	
5	15	1027	0.10	0.65	68.347	259	108	104	274	272	62	4	251	
					7.957									leak check Good @ 9
	0	1030	—	—	68.524	—	—	—	—	—	—	—		
I 1	3		0.22	1.43	70.6	290	107	104	285	285	67	6	251	
2	6		0.18	1.17	72.4	305	109	104	294	292	62	5.5	251	
3	9		0.17	1.10	74.2	307	109	104	297	299	61	5.5	252	
4	12		0.15	0.98	76.1	294	109	104	296	295	60	5.5	251	
5	15	1045	0.11	0.71	77.265	287	109	103	292	299	60	5.0	251	
					8.741									leak check - Good @ 12
	0	1103	—	—	77.455	—	—	—	—	—	—	—	—	
D 1	3		0.22	1.43	79.4	278	106	104	282	296	68	6.5	251	* STOP TEST 1106 79.745
2	6		0.20	1.30	81.9	282	106	104	287	297	66	4.0	251	RESTART 1115 80.250
3	9		0.18	1.18	83.8	301	105	104	295	300	64	4.0	251	
4	12		0.15	0.97	85.4	308	106	103	300	297	63	3.0	251	
5	15	~~1115~~ 1125	0.12	0.78	86.756	306	107	102	298	300	62	3.0	251	
					9.301									leak check - Good @ 9
	0		—	—	86.962	—	—	—	—	—	—	—	—	
C 1	3	1131	0.21	1.36	89.4	287	102	100	293	292	63	4.0	251	
2	6		0.20	1.30	91.0	290	104	99	287	292	59	4.0	251	
3	9		0.17	1.10	92.9	290	104	99	286	292	57	4.0	251	
4	12		0.14	0.91	94.4	298	104	98	285	293	57	4.0	251	
5	15	1146	0.08	0.52	95.522	302	104	98	292	294	57	3.0	251	
					8.560									leak check - Good @ 8
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Inlet
Operator: Mills
Run No.:
Date: 3/21/00
K Factor: 6.5

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1150			95.742									
B 1	3		0.14	0.91	97.6	278	94	91	277	285	55	4.5	251	
2	6		0.12	0.78	99.1	287	97	93	282	289	56	4	251	
3	9		0.10	0.65	100.6	288	98	94	280	288	55	4	252	
4	12		0.07	0.45	101.5	301	98	94	290	290	56	3.5	251	
5	13	1205	0.05	0.32	102.660	291	97	93	287	289	55	3.5	251	
					6.918									
											Tw	105.3		
											M = 10.6			
											Vmsd =		57.9	
			Avg Sqrt Delta P .36764	Avg Delta H .91785	Total Volume 6.753	Avg Ts 282.4	Avg Tm 103.8		Min/Max	Min/Max	Max Temp 68	Max Vac 6.5	Max Temp	
				Avg Sqrt Del H 0.93952	Comments:									

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CK. P292-

Determination of Stack Gas Velocity - Method 2

Client: Minn Power
Location/Plant:
Source: #3 Inlet

Operator: M.J.C.
Date: 3/21/00
W.O. Number: 2003-01 ~~00~~-100

Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 149.5
Pitot Tube/Thermo ID: P 112

Run Number	ONE		
Time	1210		
Barometric Press, in Hg (Pb)	28.70		
Static Press, in H_20 (Pstatic)	-14.8		
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) / N		Leak Check good ? Y / N		Leak Check good ? (Y) / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	0.18 Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		E	4	~~0.24~~	300	X L	2	0.24	276
			~~2~~ 5	0.09	295		3	0.25	284
							4	0.22	286
		F	3	0.10	304		5	0.12	285
			4	0.08	306				
			5	0.03	280	M	2	0.09	273
							3	0.09	275
		G	~~3~~ 1	0.12	321		4	0.07	276
			~~4~~ 2	0.17	322		5	0.02	268
			~~5~~ 3	0.18	328				
			4	0.11	322	O	2	0.03	291
			5	0.12	294		3	0.06	296
							4	~~0.0~~ 0.13	300
		H	1	0.18	327		5	0.05	294
			2	0.22	330				
			3	0.17	318				
			4	0.12	316				
			5	0.10	298				
		K	3	0.12	280				
			4	0.14	278				
			5	0.07	268				
								.33749	288.7
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$						~~.352544~~	overall
Average gas stream velocity, ft/sec.								~~.135472~~	ave.
Vol. flow rate @ actual conditions, wacf/min								.331068	
Vol. flow rate at standard conditions, dscf/min									

.135472

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

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Bo= 1149.5

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Page 1 of 3

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	IN
Run No.ID	2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Inlet
Sample Date	3/21/00
Baro. Press (in Hg)	28.67
Operator	Mills

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		162.6
Silica gel (g)		15.3
CO2, % by Vol	13	14.6
O2, % by Vol	5	5.4
Temperature (°F)	280	
Meter Temp (°F)		
Static Press (in H_2O)	-15	-14.6
Ambient Temp (°F)	90	

Meter Box ID	WC13
Meter Box Y	0.9926
Meter Box Del H	1.9718
Probe ID / Length	10
Probe Material	Boro
Pitot / Thermocouple ID	P138
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.315
Area of Stack (ft^2)	1149.5
Sample Time	120
Total Traverse Pts	40

K Factor 7.07

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.004		.008
Leak Check @ (in Hg)	5		15
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	89	88
Reference Temp	90	90
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1515			102.914									
B	3		0.11	0.77	104.7	279	102	102	288	302	68	3.0	251	
	6		0.13	0.92	106.1	286	102	102	288	302	66	3.0	251	
	9		0.12	0.85	107.7	294	103	102	292	302	65	3.0	251	
	12		0.09	0.64	109.1	307	104	102	296	303	65	3.0	251	
	15	1530	0.08	0.57	110.341	311	105	102	303	303	64	3.0	251	
					7.427 ✓									
												Leak check bad @ 7		
	0	1534	—	—	110.507	—	—	—	—	—	—	—	—	
C	3		0.22	1.56	112.5	286	105	102	289	300	66	5.0	251	
	6		0.23	1.63	114.6	293	106	102	291	300	64	5.0	251	
	9		0.18	1.28	116.5	302	107	102	293	299	61	5.0	251	
	12		0.13	0.92	118.2	300	107	102	300	292	60	4.5	251	
	15	1549	0.08	0.57	119.378	304	107	102	300	300	61	4.0	251	
					8.871 ✓									
												Leak check - Good @ 9		
D	0	1553	—	—	119.548	—	—	—	—	—	—	—	—	
	3		0.24	1.70	121.5	287	105	102	290	296	67	6.0	251	
	6		0.24	1.70	123.7	293	107	103	287	297	64	6.0	251	
	9		0.21	1.48	125.6	303	108	103	286	297	62	6.0	251	
	12		0.20	1.42	127.6	312	108	102	300	299	62	6.0	251	
	15	1608	0.10	0.71	128.800	320	108	102	302	302	61	5.0	251	
					9.252 ✓							Leak check Good @ 8		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm.		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE | Operator: Mills
Source: UNIT 3 | Run No. 3
Sample Loc.: Inlet | Date: 3/21/00 | K Factor: 7.07

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1626			129.258									
1	3		0.18	1.23	131.4	293	107	105	290	289	68	6.0	250	
	6		0.20	1.41	133.0	320	108	105	298	289	66	6.5	251	
	9		0.20	1.41	135.0	317	108	105	306	299	65	6.5	250	
	12	0.17	0.2	1.20	136.7	306	109	105	304	299	63	6.5	251	
	15	1641	0.14	0.99	138.300	296	110	105	303	301	63	6.0	251	
					9.042							leak check Good @ 10		
2	0	1645	—	—	138.510	—	—	—	—	—	—	—	—	
	3		0.17	1.20	140.4	273	108	106	279	300	67	6.5	251	
	6		0.18	1.23	142.3	284	109	105	285	288	66	7.0	251	
	9		0.17	1.20	144.0	286	109	105	282	285	65	7.0	251	
	12		0.12	0.85	145.6	284	110	105	292	290	64	6.5	251	
	15	1700	0.12	0.85	146.985	281	110	105	295	293	64	6.5	251	
					8.475							leak check Good @ 9		
3	0	1707	—	—	147.175	—	—	—	—	—	—	—	—	
	3		0.14	0.99	148.9	292	107	105	295	301	67	7.0	251	249
	6		0.14	0.99	150.5	296	108	105	291	304	66	7.5	251	
	9		0.11	0.78	152.1	304	109	105	298	309	65	7.0	252	
	12		0.12	0.85	153.6	307	109	106	304	302	66	7.0	251	
	15	1722	0.08	0.56	154.820	305	109	105	305	297	65	6.0	252	
					7.645							leak check Good @ 9		
4	0	1726	—	—	155.024	—	—	—	—	—	—	—	—	
	3		0.22	1.55	157.2	295	108	106	302	298	68	9.0	252	
	6		0.23	1.63	159.1	308	109	105	302	304	63	10.0	251	
	9		0.23	1.63	161.2	307	109	105	304	306	61	10.0	251	
	12		0.20	1.42	163.1	310	110	105	306	309	60	10.0	251	
	15	1741	0.09	0.64	164.335	309	110	105	308	310	60	7.0	251	
					9.311							leak check Good @ 14		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Inlet
Operator: Mills
Run No.: 2
Date: 3/21/00
K Factor: 7.07

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1744			164.570									
Q	3		0.13	0.92	166.2	292	106	104	287	301	66	8.0	251	
	6		0.09	0.64	167.6	304	107	104	294	302	64	7.0	251	
	9		0.08	0.57	168.9	307	108	104	298	304	63	7.0	251	
	12		0.06	0.42	170.0	309	109	105	302	306	64	6.0	251	
	15	1759	0.05	0.35	170.978	310	109	106	300	307	65	5.5	251	
					6.408									
											Tsu =	101.6		
											Mon	12.5		
											SCFM	1,030,000.		
											Total	59.1		
													1.67	m³
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			0.3796	1.0558	66.431	299.3 ~~296.8~~	105.7		271/308	285/310	68	10	252	✓ KSA
				Avg Sqrt Del H 1.0087	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

Determination of Stack Gas Velocity - Method 2

Client: Minn Power
Location/Plant: #3 Inlet
Source: _____

Operator: MJ/LS
Date: 3/21/00
W.O. Number: _____

Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 149.5
Pitot Tube/Thermo ID: P112

Run Number	2		
Time	1805 - 1823		
Barometric Press, in Hg (Pb)	28.67		
Static Press, in H_20 (Pstatic)	-14.8		
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		O	~~2~~ 1	~~0.05~~ 0.16	282	6	1	0.15	293
			~~3~~ 2	0.05	287		2	0.19	303
			~~4~~ 3	0.05	292		3	0.17	306
			4	0.05	293		4	0.12	308
			5	0.06	282		5	0.07	301
		M	2	0.11	274	F			
			3	0.10	275		3	0.09	291
			4	0.09	272		4	0.07	294
			5	0.05	264		5	0.05	282
		L	2	0.19	259				
			3	0.22	274	E	~~3~~ 2	0.18	282
			4	0.22	277		~~4~~ 3	0.18	286
			5	0.14	272		~~5~~ 4	0.12	292
							5	0.09	301
		K	3	0.11	253				
			4	0.14	273				
			5	0.08	267				
		H	1	0.22	289				
			2	0.21	294				
			3	0.16	302				
			4	0.10	304				
			5	0.08	303				
Avg Angle		Avg Delta P & Temp						.34182	285.1
		avg $\sqrt{DeltaP}$							
Average gas stream velocity, ft/sec.						overall Avg		~~.34250~~	292.1
Vol. flow rate @ actual conditions, wacf/min								.339267	
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Method2

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	IN
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Inlet
Sample Date	3/22/00
Baro. Press (in Hg)	28.70
Operator	Mills

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		147.3
Silica gel (g)		15.2
CO2, % by Vol	13	14.5
O2, % by Vol	5	5.5
Temperature (°F)	280	
Meter Temp (°F)	100	
Static Press (in H_2O)	-15	-14.4
Ambient Temp (°F)	90	

Meter Box ID	WC 13
Meter Box Y	0.9926
Meter Box Del H	1.9718
Probe ID / Length	101
Probe Material	Boro
Pitot / Thermocouple ID	P138
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.315
Area of Stack (ft^2)	149.5
Sample Time	120
Total Traverse Pts	40

K Factor 7.07

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.002		.004
Leak Check @ (in Hg)	15		14
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	85	88
Reference Temp	84	90
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0835			171.300									
Q	3		0.13	0.92	173.1	278	91	86	270	294	68	3	251	
	6		0.11	0.71	174.6	286	93	86	277	290	65	3	251	
	9		0.08	0.57	175.9	293	93	87	284	298	63	2.5	251	
	12		0.07	0.49	177.1	300	95	92	288	305	63	2.5	251	
	15	0850	0.05	0.35	178.028	296	97	92	286	306	61	2.5	251	
					6.728 ✓							Leak check - Good @ 6		
P	0	0854	—	—	178.176	—	—	—	—	—	—	—	—	
	3		0.22	1.55	180.2	284	97	93	285	298	61	4	251	
	6		0.21	1.48	182.2	297	98	93	288	300	59	4	251	
	9		0.23	1.63	184.3	302	100	93	292	299	55	4.5	251	
	12		0.22	1.55	186.3	302	100	93	295	300	53	5	251	
	15	0909	0.09	0.64	187.555	303	100	93	300	300	53	3.5	251	
					9.379 ✓							Leak check - Good @ 8		
N	0	0913	—	—	187.762	—	—	—	—	—	—	—	—	
	3		0.13	0.92	189.5	285	99	93	289	296	58	4	251	
	6		0.11	0.71	191.0	295	98	94	288	297	59	4	251	
	9		0.12	0.85	192.4	304	99	94	289	296	56	4	251	
	12		0.10	0.70	193.9	303	99	93	288	297	55	4	251	
	15	0928	0.08	0.57	195.144	299	99	93	291	298	55	4	251	
					7.382 ✓							Leak check Good @ 10		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Inlet
Operator: Mills
Run No.: 3
Date: 3/22/00
K Factor: 7.07

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0936			195.387									
J	3		0.18	1.27	197.2	262	96	93	278	285	62	5	251	
	6		0.18	1.27	199.2	267	98	94	273	285	58	5	251	
	9		0.14	0.99	200.8	276	101	98	286	297	60	5	251	
	12		0.12	0.85	202.4	282	103	99	292	300	58	5	251	
	15	0951	0.10	0.71	203.787	280	104	99	293	301	58	5	251	
					8.400 ✓							leak check - Good @ 8		
X	0	0955	—	—	203.978	—	—	—	—	—	—	—	—	
	3		0.20	1.42	206.0	285	102	99	293	302	63	6.5	252	
	6		0.22	1.56	207.9	292	104	99	296	302	61	7	251	
	9		0.20	1.42	209.9	294	105	99	300	302	59	7	252	
	12		0.17	1.20	211.7	290	105	99	300	302	58	7	251	
	15	1010	0.14	0.99	213.292	286	105	99	298	302	58	6.5	251	
					9.314 ✓							leak check Good @ 12		
D	0	1016	—	—	213.513	—	—	—	—	—	—	—	—	
	3		~~0.19~~ 0.22	1.56	215.4	282	101	99	294	299	67	8	253	
	6		0.24	1.70	217.5	291	103	99	292	295	64	8.5	251	
	9		0.20	1.42	219.5	300	104	99	292	295	60	8.5	251	
	12		~~0.16~~ 0.18	1.27	221.3	306	104	99	300	300	58	8.5	251	
	15	1033	0.10	0.71	222.793	312	104	99	301	302	58	6.5	251	
					9.280 ✓							leak check - Good @ 11		
C	0	1037	—	—	222.987	—	—	—	—	—	—	—	—	
	3		0.18	1.27	224.9	284	102	99	284	298	62	8.5	251	
	6		0.21	1.48	226.9	289	103	100	287	300	61	9	251	
	9		0.20	1.42	228.8	291	104	99	289	300	60	9	252	
	12		0.13	0.92	230.4	305	104	99	294	300	60	8	251	
	15	1052	0.08	0.57	231.764	307	104	99	299	301	60	7	251	leak check Good @ 12
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments: Vol 8.777 ✓

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Inlet
Operator: Mills
Run No.: 3
Date: 7/22/00
K Factor: 7.07

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1056			232.006									
3	3		0.12	0.85	233.6	278	101	99	282	297	66	8.0	252	
3	6		0.09	0.64	235.0	287	103	99	286	295	64	7.5	251	
	9		0.09	0.64	236.4	292	103	99	287	298	64	7.5	251	
	12		0.06	0.42	237.5	301	103	99	295	300	63	6.5	251	
	15	1111	0.05	0.35	238.609	300	103	99	298	302	64	6.0	251	
					6.603									

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
0.37172	1.01350	65.803	291.5	98.3	270/301	285/302	68	9	253

Avg Sqrt Del H: .9852

Comments:

103.0 %I
11.4 %M
1,020,000 SCFM
59.4 Vmstd
1.69 m³

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Determination of Stack Gas Velocity - Method 2

Client: MINN Power
Location/Plant: Boswell
Source: #3 Inlet

Operator: Mills
Date: 3/22/00
W.O. Number:

Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 1149.5
Pitot Tube/Thermo ID: P112

Run Number	3		
Time	1117 – 1141		
Barometric Press, in Hg (Pb)	28.70		
Static Press, in H_20 (Pstatic)	-14.4		
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N		
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	
		E	~~1~~ 2	0.18	268	K	3	0.11	256	
.02	<5		~~2~~ 3	0.17	274		4	0.12	264	0 —
			~~3~~ 4	0.17	278		5	0.08	258	
			5	0.10	280					
		F	3	0.07	274	L	~~1~~ 2	0.15	265	
0	—		4	0.05	281		~~2~~ 3	0.16	270	
			5	0.04	276		~~3~~ 4	0.14	276	.17 10
							5	0.10	276	
		G	1	0.15	278					
0	—		2	0.17	284	M	2	0.12	265	
			3	0.15	293		3	0.09	271	
			4	0.11	297		4	0.07	270	0 —
			5	0.06	293		5	0.04	262	
		H	1	0.18	287	O	1	0.08	259	
			2	0.20	291		2	0.04	270	
0	—		3	0.14	296		3	0.04	275	.02 <5
			4	0.08	302		4	0.17	282	
			5	0.06	302		5	0.05	278	
Avg Angle		Avg Delta P & Temp						.34739	285.1	Overall
		avg √DeltaP						~~.34739~~		Overall
Average gas stream velocity, ft/sec.								.326993		
Vol. flow rate @ actual conditions, wacf/min										
Vol. flow rate at standard conditions, dscf/min										

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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Method2

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SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE
Location/Plant: MP BOSWELL
W.O. #: 20009.011.006.1100
Source & Location: UNIT 3 Inlet

Run No. 1 — Sample Date 3/21/00 — Recovery Date 3/21/00

Sample I.D. MPBW - U3 - IN - 1 - OHM - 20MAR2000 — Analyst EERC — Filter Number No. 1 Thim

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	830.9	734.2	741.4	684.7	730.4	619.6	716.0	5057.2	929.7	5986.9
Initial	726.8 100	717.7 100	732.0 100	680.6 100	730.5 100	622.6 100	713.4 100	4923.6	915.1 300	5838.7
Gain	104.1	16.5	9.4	4.1	-0.1	-3.0	2.6	133.6	14.6	148.2

Impinger Color: all clear except KMnO4 — Labeled? ✓

Silica Gel Condition: 1/3 pink — Sealed? ✓

Run No. 2 — Sample Date 3/21/00 — Recovery Date 3/21/00

Sample I.D. MPBW - U3 - IN - 2 - OHM - 20MAR2000 — Analyst EERC — Filter Number #2 thimb

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	817.2	738.7	715.8	657.8	720.8	710.7	620.9		882.1	
Initial	702.7 100	718.9 100	710.5 100	653.9 100	703.2 100	703.2 100	626.9 100	4819.3	865.8 300	5685.1
Gain	114.5	19.8	5.3	3.9	17.6	7.5	-6.0	162.6	16.3	178.9

Impinger Color: all clear except KMnO4 — Labeled? ✓

Silica Gel Condition: 1/2 pink — Sealed? ✓

Run No. 3 — Sample Date 3/22/00 — Recovery Date 3/22/00

Sample I.D. MPBW - U3 - IN - 3 - OHM - 20MAR2000 — Analyst EERC — Filter Number #4 thimble

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	851.6	730.9	607.4	730.9	721.9	737.4	635.5	5015.6	873.2	5888.8
Initial	735.8 100	711.1 100	601.5 100	725.7 100	721.7 100	737.6 100	634.9 100	4868.3	858.0 300	5726.3
Gain	115.8	19.8	5.9	5.2	0.2	-0.2	0.6	147.3	15.2	162.5

Impinger Color: all clear except KMnO4 — Labeled? ✓

Silica Gel Condition: lt. blue — Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE
Location/Plant: MP BOSWELL
W.O. #: 20009.011.006.1100
Source & Loaction: UNIT 3 Inlet

Run No. BT
Sample Date 3/21/00
Recovery Date 3/21/00
Sample I.D. MPBW - U3 - IN - BT - OHM - 20MAR2000
Analyst EEC
Filter Number #3 thimble

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	737.9	735.6	741.7	698.7	728.7	698.9	722.7	5064.2	858.0	5922.2
Initial	737.1 100	735.5 100	741.6 100	698.7 100	728.6 100	698.9 100	722.5 100	5062.9	857.8 300	5920.7
Gain	0.8	0.1	0.1	0.0	0.1	0.0	0.2	1.3	0.2	1.5

Impinger Color all clear except KMnO4
Labeled? ✓
Silica Gel Condition 1/4 pink
Sealed? ✓

Run No. ___
Sample Date ___
Recovery Date ___
Sample I.D. ___
Analyst ___
Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___
Labeled? ___
Silica Gel Condition ___
Sealed? ___

Run No. ___
Sample Date ___
Recovery Date ___
Sample I.D. ___
Analyst ___
Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___
Labeled? ___
Silica Gel Condition ___
Sealed? ___

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Source Gas Analysis Data Sheet - Method 3

Client DOE

Location/Plant Boswell

Source Unit 3 Inlet

W.O. Number 20009-011-006

Analyst KA

Date 3-21-00

Analytical Method ~~(circle one)~~ O + SAT

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.7	20	5.3	
2		14.6	20	5.4	
3		14.6	20	5.4	
	Average	14.63	20	5.37	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.6	20.0	5.4	
2		14.6	20.0	5.4	
3		14.6	20.0	5.4	
	Average	14.6	20.0	5.4	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.6	20	5.4	
2		14.5	20	5.5	
3		14.5	20	5.5	
	Average	14.53	20	5.47	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

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Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client DOE/MP
Loaction/Plant [redacted]SWELL
Source Unit 3 Stack

Operator [redacted]
Date [redacted]
W.O. Number [redacted] 011 [redacted] 1700

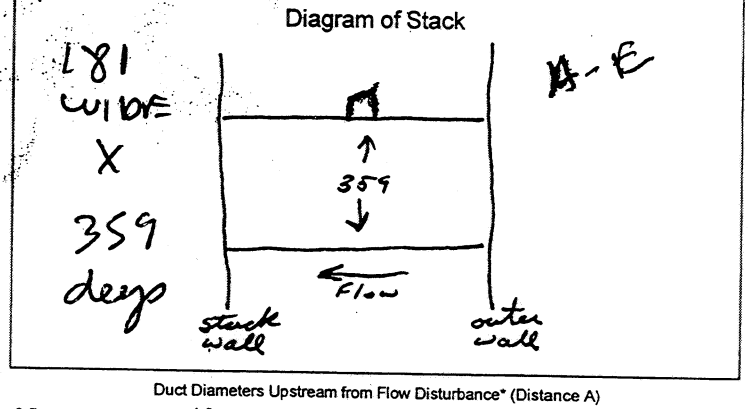
Duct Type	☐ Circular	☐ Rectangular Duct	Indicate appropriate type
Traverse Type	[redacted] Particulate Traverse	☐ Velocity Traverse	359 x 181 = 451.2

Distance from far wall to outside of port (in.) = C	371
Port Depth (in.) = D	12
Depth of duct, diameter (in.) = C-D 360"	359 x 181
Area of Duct (ft^2) 360" x 181 =	45.5
Total Traverse Points	25
Total Traverse Points per Port	5

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	181"
Total Ports (rectangular duct only)	5

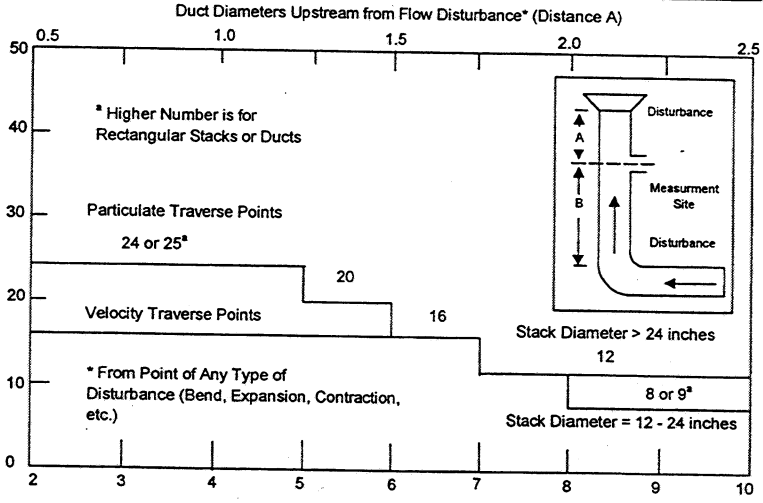
Flow Disturbances	
Upstream - A (ft)	4'
Downstream - B (ft)	10'
Upstream - A (duct diameters)	<1.0
Downstream - B (duct diameters)	<1.0

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	10	18	30
2	30	54	66
3	50	90	102
4	70	126	138
5	90	162	174
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Determination of Stack Gas Velocity - Method 2

Client: DOE/MP
Location/Plant:
Source: Unit 3 Outlet
Operator: KA
Date: 3/28/00
Pitot Tube/Thermo ID: P301
Pitot Coeff (Cp): .840
Stack Area, ft² (As): 452.5

Run Number	Preliminary		
Time			
Barometric Press, in Hg (Pb)			
Static Press, in H_2O (Pstatic)			
Source Moisture, % (BWS)	-1.8		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	.25	125				
			2	.30	125				
			3	.28	125				
			4	.28	125				
			5	.27	125				
		B	1	.54	123				
			2	.51	125				
			3	.36	125	-1.8			
			4	.30	125				
			5	.29	122				
		C	1	.58	124				
			2	.58	124				
			3	.49	125				
			4	.34	124				
			5	.26	124				
		D	1	.48	123				
			2	.51	124				
			3	.30	124				
			4	.24	124				
			5	.32	124				
		E	1	.41	123				
			2	.28	123				
			3	.32	124				
			4	.31	124				
			5	.29	124				
Avg Angle		avg√DeltaP & Temp		.5967	124.1	.35			
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

~ .275

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

Method2

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Tare
Filter No. 1 0.37411

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	OUT
Run No.ID	1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Outlet
Sample Date	3-21-00
Baro. Press (in Hg)	28.70
Operator	[illegible]

Stack Conditions

	Assumed	Actual
% Moisture	12	
Impinger Vol (ml)		236.1
Silica gel (g)		22.0
CO_2, % by Vol	10	13.8
O_2, % by Vol	10	6.0
Temperature (°F)	125	
Meter Temp (°F)	55	
Static Press (in H_2O)	-1.8	-1.8
Ambient Temp (°F)	49	

Meter Box ID	8
Meter Box Y	1.016
Meter Box Del H	1.591
Probe ID / Length	TFE / 16
Probe Material	Boro
Pitot / Thermocouple ID	PS01
Pitot Coefficient	0.84
Nozzle ID	Boro 273
Avg Nozzle Dia (in)	.273
Area of Stack (ft^2)	45.25
Sample Time	125
Total Traverse Pts	25

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.008		.015
Leak Check @ (in Hg)	15		17
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	48	47
Reference Temp	47	47
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

K Factor

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0903			276.583									
A 1	5		.30	1.1	280.22	124	49	47	227	249	66	5		3.78
2	10		.32	1.2	282.57	123	53	49	235	250	59	5		
3	15		.33	1.2	285.78	124	53	49	241	247	56	5		
4	20		.32	1.2	288.25	123	54	50	247	249	56	5		3.90
5	25	0928	.32	1.2	291.227	124	54	49	248	248	56	6		
				LK ✓	good @	8"	.006						14.644	
	0	0950	.51	2.0	291.318	124	51	49	247	251	55	8		
B 1	5		.44	1.7	295.15	124	52	50	240	247	54	8		
2	10		~~.30~~ .28	1.1	298.91	124	55	50	247	245	52	7		
3	15		.28	1.1	302.05	124	55	50	247	246	52	7		
4	20		.29	1.1	305.18	124	54	49	248	246	52	7	16.75	
5	25	1015			308.068									
				LK ✓	good @	10"	.011							
	0	1019			308.179									
C 1	5		.55	2.1	312.30	124	~~24~~ 53	49	247	248	55	10		
2	10		.52	2.0	316.08	124	55	50	245	247	55	11		
3	15		.40	1.6	319.80	125	55	50	246	247	56	10		
4	20		.27	1.1	322.70	125	56	51	247	246	58	8		
5	25	1044	.18	.70	325.302	124	55	51	248	247	58	7		
				LK ✓	good @	13"	.012						17.123	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

CK P.E.D.

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Outlet
Operator: KBA
Run No.: 1
Date: 3-21-00
K Factor:

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1048			325.395									
D 1	5		.48	1.5	329.04	125	54	51	239	248	59	13		
2	10		.50	2.0	332.92	125	56	52	230	253	60	14		
3	15		.27	1.1	336.10	124	58	52	240	247	59	11		
4	20		.22	.86	338.81	124	57	52	248	248	59	10		
5	25	1103	.34	1.4	342.025	124	56	52	249	250	58	13		
				LK	✓ good @	16"	.015						16.63	
	0	1135			342.182									
E 1	5		.37	1.4	345.36	124	51	51	246	248	55	14		
2	10		.20	.78	348.03	125	52	50	246	248	53	12		
3	15		.28	1.1	351.00	125	55	51	248	248	52	13		
4	20		.28	1.1	354.19	125	55	51	247	250	50	13		
5	25	1200	.28	1.1	357.260	125	55	51	248	249	50	13		
													15.078	
		24 5/16										101.2	%I	
												13.1	% m	
												711740	DSCFM	
												80.8	Vm std	
												2.26	m³	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			.5779	1.3256	80.225	124.2	52.2		227/248	246/251	66	14		
				Avg Sqrt Del H	Comments:	I = 101								
				1.1389		Bwsz 13.1								

WESTON
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Filter No. 2 Tare 0.3916 g

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	OUT
Run No.ID	2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Outlet
Sample Date	3-21-00
Baro. Press (in Hg)	28.67
Operator	[illegible]

Stack Conditions

	Assumed	Actual
% Moisture	13.1	
Impinger Vol (ml)		247.3
Silica gel (g)		21.6
CO2, % by Vol	13.8	13.4
O2, % by Vol	6.0	6.4
Temperature (°F)	124	
Meter Temp (°F)	52	
Static Press (in H_2O)	-1.8	-1.8
Ambient Temp (°F)	55	

Meter Box ID	8
Meter Box Y	1.016
Meter Box Del H	1.591
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	Boro
Avg Nozzle Dia (in)	.273
Area of Stack (ft^2)	452.5
Sample Time	125
Total Traverse Pts	25

Leak Checks

	Initial	Mid-Point	Final
Sample Train (ft^3)	.012		.016
Leak Check @ (in Hg)	17		13
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check

	Pre-Test Set	Post-Test Set
Meter Box Temp	89	86
Reference Temp	88	86
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

K Factor

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1516			357.812									
A 1	5		.24	.89	360.64	124	52	51	251	234	56	4		3.70
2	10		.40	1.5	364.12	124	53	51	246	251	56	5		
3	15		.27	1.0	366.92	124	55	51	247	251	56	5		
4	20		.30	1.1	369.82	124	55	51	251	251	56	5		
5	25	1541	.27	1.0	372.703	123	57	52	252	251	57	5		
				LK ✓ good		9"	.007						14.891	
		1553	—	—	373.742	—	—	—	—	—	—	—		
B 1	30		.61	2.3	376.95	122	50	50	249	251	58	8		
2	35		.50	1.9	380.57	124	56	52	250	250	62	8		
3	40		.29	1.1	384.07	124	58	53	251	254	62	6		
4	45		.23	.85	386.68	123	58	53	251	252	63	6		
5	50	1518	.28	1.0	389.541	123	58	54	254	252	66	6		
				good @ 10		.008							15.799	
			—	—	388.601	—	—	—	—	—	—	—		
C 1	55	1628	.77 .90	2.8	394.53	124	52	52	258	257	60	13		
2	60		.53	2.0	398.46	123	55	52	254	252	59	11		
3	65		.43	1.6	402.22	123	58	53	243	252	60	10		
4	70		.30	1.1	405.10	123	57	52	253	253	61	8		
5	75	1653	.20	.74	407.651	123	56	52	259	253	61	8		
					good @ 11		.008						18.005	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Outlet
Operator: [illegible]
Run No.: 2
Date: 3-21-00
K Factor:

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (In H2O)	ORIFICE PRESSURE Delta H (In H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (In Hg)		COMMENTS
	0	1656			407.715									
D 1	80		.63	2.5	411.97	124	55	52	267	257	61	13		
2	85		.37	1.4	415.47	124	56	52	252	252	61	11		
3	90		.25	.93	418.34	124	57	53	253	252	61	9		
4	95		.22	.81	420.96	123	56	52	255	252	63	8		
5	100	1721	.43	1.6	424.131	123	55	51	254	254	63	11		
					good @	18	.012						16.416	
			—	—	424.251	—	—	—	—	—	—	—		
E 1	105	1731	.53	2.0	428.16	124	51	50	256	249	62	13		
2	110		.19	.70	430.53	124	54	51	253	251	63	8		
3	115		.33	1.2	433.60	123	54	51	254	250	63	10		
4	120		.28	1.0	436.32	123	55	51	254	256	64	10		
5	125	1756	.28	1.0	439.179	122	55	51	254	252	65	10		
													14.928	
										98.5% I				
										13.6% M			80.43 V	
													2.28 m³	
			Avg Sqrt Delta P .59297	Avg Delta H 1.3528	Total Volume 80.084	Avg Ts 123.4	Avg Tm 53.4		Min/Max 244/267	Min/Max 239/257	Max Temp 65	Max Vac 13	Max Temp 13	
				Avg Sqrt Del H 1.1408	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

CK
P.22.

Filter # 4 True 0.37917

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U3
Samp. Loc. ID	OUT
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 3 Outlet
Sample Date	3-22-00
Baro. Press (in Hg)	28.70
Operator	[illegible]

Stack Conditions

	Assumed	Actual
% Moisture	13	
Impinger Vol (ml)		241.4
Silica gel (g)		20.8
CO2, % by Vol	13.8	13.0
O2, % by Vol	6	6.7
Temperature (°F)	52	
Meter Temp (°F)	125	
Static Press (in H_2O)	-1.8	-1.8
Ambient Temp (°F)	45	

Meter Box ID	8
Meter Box Y	1.016
Meter Box Del H	1.551
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.273
Area of Stack (ft^2)	452.5
Sample Time	125
Total Traverse Pts	25

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.016		.012
Leak Check @ (in Hg)	16		15
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	[illegible]	[illegible]
Reference Temp	[illegible]	[illegible]
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0836			441.277									
A 1	5		.38	1.4	444.81	123	49	46	248	250	55	4		3.7
2	10		.37	1.4	448.05	123	50	46	249	243	55	4		
3	15		.28	1.0	450.82	122	53	48	250	254	55	4		
4	20		.28	1.0	453.80	122	54	48	256	244	56	4		
5	25	0901	.30	1.1	456.72	123	55	49	257	257	57	5		
							.011 @ 10"						15.396	
		0910			456.820									
B 1	30		.56	2.1	460.69	122	50	49	253	255	57	6		
2	35		.47	1.7	464.35	124	56	52	259	260	59	6		
3	40		.28	1.0	467.25	124	57	52	251	258	60	5		
4	45		.23	.85	468.58	124	58	52	251	256	61	5		
5	50	0935	.30	1.1	472.929	124	58	53	260	256	63	6		
							.008 @ 9						16.109	
					472.985									
C 1	55	0938	.67	2.5	477.06	123	56	53	267	258	62	9		
2	60		.52	1.9	481.02	123	58	53	256	258	63	8		
3	65		.42	1.6	484.61	123	59	53	258	260	65	7		
4	70		.28	1.0	487.64	123	59	53	263	257	66	7		
5	75	1003	.18	.67	490.171	123	59	53	268	257	66	6		
							.009 @ 10						17.186	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Filter # 004

WESTON MANAGERS DESIGNERS/CONSULTANTS

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 3
Sample Loc.: Outlet
Operator: JA
Run No.: 3
Date: 3-22-00
K Factor:

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1019			490.240									
D 1	80		.50	1.9	494.00	124	54	53	260	259	60	8		
2	85		.44	1.6	497.64	123	56	53	258	258	54	8		
3	90		.22	.81	500.35	123	57	53	258	257	52	7		
4	95		.22	.81	502.98	123	58	54	263	257	54	7		
5	100	1044	.32	1.2	505.959	122	59	55	267	258	56	8		
							.014 @ 13						15.719	
					506.065									
E 1	105	1047	.46	1.7	509.5	123	57	55	268	257	56	9		
2	110		.23	.85	512.33	124	58	55	263	258	56	7		
3	115		.25	.93	515.30	124	59	55	262	258	55	7		
4	120		.30	1.1	518.20	125	61	56	268	256	58	8		
5	125	1112	.34	1.3	521.226	124	62	57	266	259	59	9		
													15.161	
													100.5	% I
													13.4	% m
													707000	DSCFM
													79.8	Vm
													2.26	m³
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			.5847	1.3008	79.571	123.2	54.4		248/268	243/260	66	9		
				Avg Sqrt Del H	Comments:									
				1.1240										

WESTON MANAGERS DESIGNERS/CONSULTANTS

CK. PEB.

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Location: UNIT 3 Outlet

Run No. 1 | Sample Date 3/21/00 | Recovery Date 3/21/00

Sample I.D. MPBW - U3 - OUT - 1 - OHM - 20MAR2000 | Analyst EERC | Filter Number Filter #1

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	893.1	759.1	737.6	761.5	731.7	733.0	726.1	5342.1	1007.2	6349.3
Initial	718.7 100	715.1 100	723.0 100	756.2 100	731.8 100	732.1 100	727.3 100	5104.2	985.2 300	6089.4
Gain	174.4 ✓	44.0 ✓	14.6 ✓	5.3 ✓	-0.1 ✓	0.9 ✓	-1.2 ✓	~~237.9~~	22.0 ✓	~~[illegible]~~

Impinger Color all clear except KMnO4 | Labeled? ✓ | 236.1 ✓ | 258.1

Silica Gel Condition 2/3 pink | Sealed? ✓

Run No. 2 | Sample Date 3/21/00 | Recovery Date 3/21/00

Sample I.D. MPBW - U3 - OUT - 2 - OHM - 20MAR2000 | Analyst EERC | Filter Number #2

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	851.5	815.7	657.9	716.2	735.5	740.5	603.4	5120.7	971.5	6092.2
Initial	717.3 100	739.9 100	634.2 100	707.9 100	732.0 100	738.9 100	603.2 100	4573.4	949.9 300	5823.3
Gain	134.2 ✓	75.8 ✓	23.7 ✓	8.3 ✓	3.5 ✓	1.6 ✓	0.2 ✓	~~[illegible]~~	21.6 ✓	~~[illegible]~~

Impinger Color all clear except KMnO4 | Labeled? ✓ | 247.3 ✓ | 268.9

Silica Gel Condition | Sealed? ✓

Run No. 3 | Sample Date 3/22/00 | Recovery Date 3/22/00

Sample I.D. MPBW - U3 - OUT - 3 - OHM - 20MAR2000 | Analyst EERC | Filter Number #4

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	825.9	712.6	758.8	621.2	754.6	712.1	729.5	5114.7	913.6	6028.3
Initial	707.4 100	637.8 100	728.0 100	611.4 100	750.5 100	710.1 100	728.1 100	4873.3	892.8 300	5766.1
Gain	118.5 ✓	74.8 ✓	30.8 ✓	9.8 ✓	4.1 ✓	2.0 ✓	1.4 ✓	241.4 ✓	20.8 ✓	262.2 ✓

Impinger Color all clear except KMnO4 | Labeled? ✓

Silica Gel Condition 1/3 pink | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS/DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Loaction: UNIT 3 Outlet

Run No. BT | Sample Date: | Recovery Date:

Sample I.D. MPBW - U3 - OUT - BT - OHM - 20MAR2000 | Analyst: | Filter Number:

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	737.1 100	735.5 100	741.6 100	698.7 100	728.6 100	698.9 100	722.5 100		857.8 300	
Gain										

Impinger Color: | Labeled?:

Silica Gel Condition: | Sealed?:

Run No. | Sample Date: | Recovery Date:

Sample I.D. | Analyst: | Filter Number:

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color: | Labeled?:

Silica Gel Condition: | Sealed?:

Run No. 3 out BT | Sample Date: 3/22/00 | Recovery Date: 3/22/00

Sample I.D. | Analyst: ERC | Filter Number: #5

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	721.8	630.6	593.6	742.9	696.4	747.5	602.5	4735.3	928.5	5663.8
Initial	721.3 100	630.7 100	593.6 100	742.8 100	696.4 100	747.5 100	602.5 100	4734.8	929.1 300	5663.9
Gain	0.5	-0.1	0.0	0.1	0.0	0.0	0.0	0.5	-0.6	-0.1

Impinger Color: | Labeled?: ✓

Silica Gel Condition: | Sealed?: ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Source Gas Analysis Data Sheet - Method 3

Client DOE/Boswell

Location/Plant Boswell

Source Unit 3 Stack

W.O. Number

Analyst KA

Date 3-21-00

Analytical Method (~~circle one~~) ORSAT

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1	1400	13.8	19.8	6.0	
2		13.8	19.8	6.0	
3		13.8	19.8	6.0	
	Average	13.8	19.8	6.0	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.4	19.8	6.4	
2		13.4	19.8	6.4	
3		13.4	19.8	6.4	
	Average	13.4	19.8	6.4	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.0	19.8	6.8	
2		13.0	19.8	6.8	
3		13.0	19.6	6.6	
	Average	13.0	19.7	6.73	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

WESTON MANAGERS DESIGNERS/CONSULTANTS

Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

~~271~~ 287.8 ~~295.~~

Client DOE MP
Loaction/Plant Unit 4
Source INLET A DUCT

Operator Fowler
Date 3/25/00
W.O. Number 3039.1

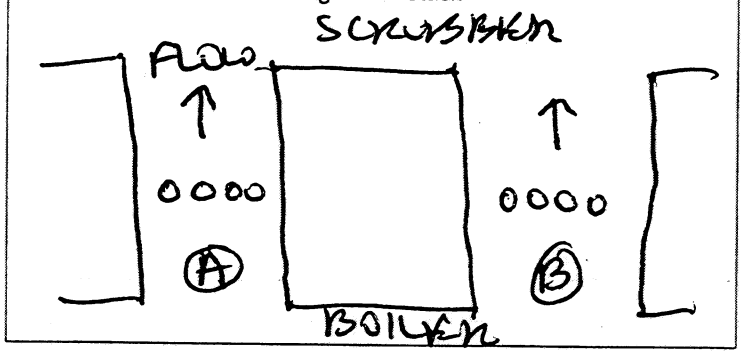
Duct Type	☐ Circular	☒ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	179 + 22 = 201
Port Depth (in.) = D	22
Depth of Duct, diameter (in.) = C-D	157 ~~167~~ 157
Area of Duct (ft^2)	267.33
Total Traverse Points	24
Total Traverse Points per Port	6

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	264
Total Ports (rectangular duct only)	4

Flow Disturbances	
Upstream - A (ft)	167
Downstream - B (ft)	492
Upstream - A (duct diameters)	0.85
Downstream - B (duct diameters)	2.5

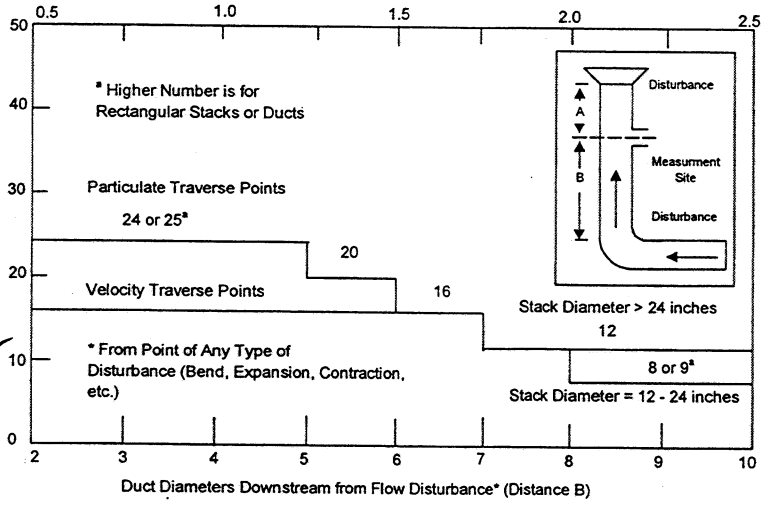
Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	8.3	13.0	35.0
2	25	39.2	61.2
3	41.7	65.5	87.5
4	58.3	91.5	113.5
5	75.0	117.7	139.7
6	91.7	144	166
7			
8			
9			
10		2x157x264	~~421~~
11			
12			= 196.9

Equivalent Diameter = (2*L*W)/(L+W)



Traverse Point Location Percent of Stack -Circular

Traverse Point Location	Number of Traverse Points 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point Location	Number of Traverse Points 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Determination of Stack Gas Velocity - Method 2

Client: DOE MP
Location/Plant: UNIT 4
Source: INLET A DUCT
Operator: Powell
Date: 3/25/00
W.O. Number:
Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 237.83
Pitot Tube/Thermo ID: P305

Run Number	Preliminary		
Time	1225		
Barometric Press, in Hg (Pb)	28.23		
Static Press, in H_20 (Pstatic)	-14.0		
Source Moisture, % (BWS)	9.48		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	.64	254				
			2	.71	266				
0	0		3	.90	277				
			4	.67	286				
			5	.68	300				
			6	.44	292				
		B	1	.55	276				
			2	.59	281				
0	0		3	.58	286				
			4	.30	300				
			5	.35	295				
			6	.32	292				
		C	1	.56	285				
			2	.69	296				
0	0		3	.61	302				
			4	.20	307				
			5	.15	308				
			6	.20	309				
		D	1	.66	290				
			2	.74	298				
0	0		3	.75	305				
			4	.48	315				
			5	.51	315				
			6	.54	317				
Avg Angle		Avg Delta P & Temp		.5077	294.3				
		avg √DeltaP		.71254					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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C.T.
REP.

670100.
SCFM
314*
based on
24' WIMP

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Sample and Velocity Traverse Point Data Sheet - Method 1

~~2729~~ 265.8

Client DOE MP
Loaction/Plant Unit 4
Source INLET B DUCT

Operator L.T. / B.E.D.
Date 3/25/00
W.O. Number 20009-011-006

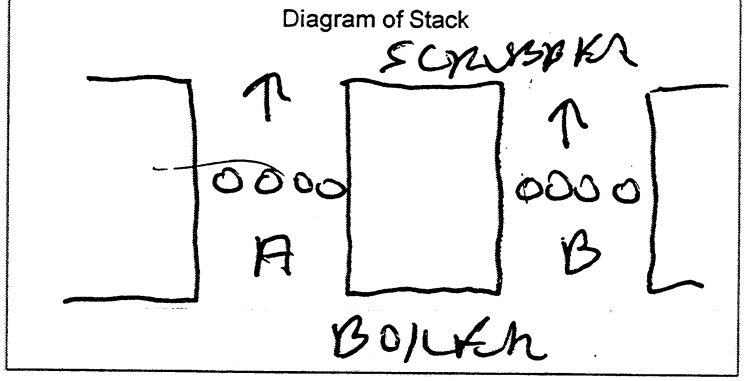
Duct Type	☐ Circular	☒ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	16 6 6 25
Port Depth (in.) = D	21.25
Depth of Duct, diameter (in.) = C-D	145.0
Area of Duct (ft^2)	~~264~~ 265.8
Total Traverse Points	24
Total Traverse Points per Port	6

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	264
Total Ports (rectangular duct only)	4

Flow Disturbances	
Upstream - A (ft)	236
Downstream - B (ft)	432
Upstream - A (duct diameters)	1.3
Downstream - B (duct diameters)	2.4

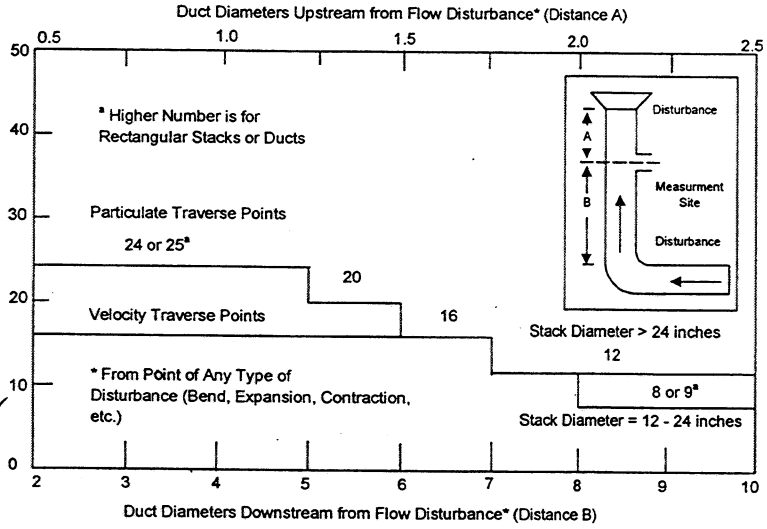
Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	8.3	12.0	33.3
2	25.0	36.2	67.5
3	41.7	60.5	81.7
4	58.3	84.5	105.8
5	75.0	108.7	130.0
6	91.7	132.9	154.2
7			
8			
9			
10		2 x 145 x 264 / 421	
11			
12			= 181.9

Equivalent Diameter = (2*L*W)/(L+W)



Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Determination of Stack Gas Velocity - Method 2

Client: DOE-MP
Location/Plant: UNIT 4
Source: INLET BDVS
Operator: Powers
Date: 3/25/00
W.O. Number:
Pitot Coeff (Cp): 0.84
Stack Area, ft² (As): 2.58
Pitot Tube/Thermo ID: P305

Run Number	Pre		
Time	1145		
Barometric Press, in Hg (Pb)	28.23		
Static Press, in H_2O (Pstatic)	-14.0		
Source Moisture, % (BWS)	9.48		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	1.2	306				
			2	1.2	302				
			3	1.1	300				
			4	1.1	302				
			5	.92	300				
0	0		6	.73	298				
0	0	B	1	.67	286				
			2	.80	287				
			3	.80	287				
			4	.70	290				
			5	.45	296				
			6	.40	293				
		C	1	.80	294				
			2	.85	295				
			3	.85	290				
			4	.75	276				
			5	.62	280				
			6	.56	273				
		D	1	~~.89~~ 1.1	257				
			2	1.1	262				
			3	1.0	269				
0	0		4	.93	271				
			5	.93	276	.225			
			6	.95	288	1.6			
				25.46					
Avg Angle		Avg Delta P & Temp		~~.889~~	286.3				
		avg √DeltaP		.916272					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

290
647000

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Determination of Moisture Content in Stack Gases - Method 4

Client DOE MP
Location/Plant Cohasset, Mn
Source Unit 4 Duct B

Operator RCD
Meter Box ID 13

Date 3/25/00
Meter Box Y .9926

W.O. Number _____ Temperature °C or °F 48 Sample Volume, ft³ or L _____

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
Preliminary				Inlet	Outlet				205 204	Initial 0.000 @ 10"
	End Test	1222	261.043	72	68	1.5	238	307		Final 0.000 @ 10"
Baro Press., Pb (in Hg)	Start Test	1150	239.300	66	65	1.5	200	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
28.23	Avg. or Total	32	21.743	67.75		1.5	38	7	2.12	~~9.48~~ 9.39

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)} \right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percen

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

CK. RCD.

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Thimble # 19

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

265.8

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	IN
Run No.ID	RED. 1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Inlet
Sample Date	3/27/00
Baro. Press (in Hg)	33.11
Operator	RED.

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		149.7
Silica gel (g)		12.5
CO2, % by Vol	13	14
O2, % by Vol	6	5.6
Temperature (°F)	310	
Meter Temp (°F)		
Static Press (in H_2O)		-15.00
Ambient Temp (°F)	36	

Meter Box ID	13
Meter Box Y	0.9926
Meter Box Del H	1.9718
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.195
Area of Stack (ft^2)	265.8 Bulet
Sample Time	120 min
Total Traverse Pts	24

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	0.005		0.000
Leak Check @ (in Hg)	15		10"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	41	40
Reference Temp	48	39
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1700			281.700									
A 1	5		1.7	1.63	285.3	321	45	44	250	257	36	4	253	K = 0.98
2	10		1.6	1.54	288.7	322	47	45	252	266	40	4	268	
3	15		1.5	1.44	292.0	323	49	44	254	258	37	4	270	
4	20		1.3	1.25	295.0	316	50	43	251	268	37	4	276	
5	25		1.1	1.06	297.7	320	49	43	252	256	36	4	280	
6	30	1730	1.1	1.06	300.518	306	48	43	250	250	34	4	282	
					18.818									
	0	1818	—	—	300.785	—	—	—	—	—	—	—		0.000 @ 6"
B 1	5		1.2	1.12	303.4	312	46	45	251	252	34	4	276	K = 0.93
2	10		1.1	1.02	306.2	312	48	43	252	260	34	4	277	
3	15		1.2	1.12	309.0	313	48	43	251	260	35	4	282	
4	20		.90	.84	311.5	321	49	44	252	264	35	4	280	
5	25		.63	.59	313.6	322	47	43	255	265	34	4	278	
6	30	1848	.60	.56	315.725	310	47	42	253	258	33	4	279	
				315.840	14.840									
	0	1925	—	—	315.840	—	—	—	—	—	—	—		0.000 @ 10"
C 1	5		1.2	1.12	318.8	292	46	42	251	252	29	5	287	
2	10		1.2	1.12	321.6	296	48	43	250	252	30	5	287	
3	15		1.2	1.12	324.5	303	48	42	253	261	30	5	285	
4	20		1.0	.93	327.1	306	48	41	255	252	30	5	282	
5	25		.84	.78	329.5	294	48	42	255	250	29	5	279	
6	30	1950	.78	.73	331.920	287	48	42	254	250	28	5	277	
					16.080									
														0.000 @ 8"
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Inlet
Operator: P.E.D.
Run No.: 1
Date: 3/27/00
K Factor: 0.93

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	2017			332.050									
D 1	5		1.5	1.40	335.2	290	45	43	250	255	26	6	285	
2	10		1.5	1.40	338.5	288	47	43	252	262	27	6	283	
3	15		1.3	1.21	341.5	307	48	42	255	251	27	6	281	
4	20		1.2	1.12	344.4	322	46	41	254	250	27	6	279	
5	25		1.1	1.02	347.1	323	46	41	253	258	27	7	278	
6	30	2047	.84	.78	349.600	314	46	41	253	260	28	6	278	
					17.550									
													105.39 ft³	
													10.490 m	
													~~680.040~~ SCFM	
									TOT = 1,213,000				668.000	
													65.85 Vm std	
													1.86 m³	
Avg Sqrt Delta P				Avg Delta H	Total Volume	Avg Ts		Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
1.0652				1.08167 / ~~1.0567~~	67.385	309.6		45.1	245/255	250/260	40	7	285	
				Avg Sqrt Del H 1.03121	Comments:									

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VTB

Asc 265 TP 265.8 Thimble #20

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	IN
Run No.ID	2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Inlet
Sample Date	3/28/00
Baro. Press (in Hg)	29.47
Operator	P.D.

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		165.1
Silica gel (g)		12.4
CO2, % by Vol	14	14.4
O2, % by Vol	6	5.2
Temperature (°F)		
Meter Temp (°F)	50	
Static Press (in H_2O)	-15.0	-16.0
Ambient Temp (°F)	32	

Meter Box ID	13
Meter Box Y	.9926
Meter Box Del H	1.9718
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.195
Area of Stack (ft^2)	265.8 Blot
Sample Time	120 min
Total Traverse Pts	24

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	0.015		0.002
Leak Check @ (in Hg)	15		10"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	45	48
Reference Temp	44	47
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	837			350.241									
A 1	5		1.5	1.38	353.6	304	47	47	250	251	28	4	304	15 = 0.002
2	10		1.5	1.38	356.5	303	47	46	252	260	30	4	303	
3	15		1.3	1.20	359.8	306	49	47	251	253	33	4	305	
4	20		1.2	1.10	362.6	302	48	44	251	262	32	4	302	
5	25		1.1	1.01	365.3	304	47	43	253	254	30	4	304	
6	30	907	.93	.86	367.830	296	47	43	252	256	30	4	300	
					17.429	302.670								0.002 @ 10"
	0	936	—	—	367.958	—	—	—	—	—	—	—	—	
B 1	5		1.2	1.1	370.8	285	44	44	252	257	27	4	304	
2	10		1.2	1.1	373.6	289	47	45	250	262	31	5	304	
3	15		1.2	1.1	376.5	293	47	45	251	255	33	5	301	
4	20		.98	.81	378.9	299	48	45	251	260	35	5	304	
5	25		.61	.56	380.9	297	47	44	252	251	36	4	300	
6	30	1006	.58	.53	382.887	295	47	44	251	257	35	4	304	
					14.929									0.002 @ 10"
	0	1032	—	—	382.965	—	—	—	—	—	—	—		
C 1	5		1.1	1.01	385.7	273	48	47	253	254	32	5	304	
2	10		1.1	1.01	388.4	273	50	46	254	252	34	5	306	
3	15		1.2	1.10	391.3	280	51	45	254	257	34	6	306	
4	20		.90	.83	393.8	282	51	44	252	252	34	6	306	
5	25		.79	.73	396.1	271	51	44	252	257	35	6	306	
6	30	1102	.70	.64	398.390	260	50	44	251	253	35	5	307	
					15.425									0.002 @ 8"
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Inlet
Operator: RCD
Run No.: 2
Date: 3/28/00
K Factor: 0.93

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1132			398.505									
D 1	5		1.3	1.21	401.5	269	48	46	252	254	32	6	308	
2	10		1.4	1.30	404.6	267	49	45	250	253	32	7	310	
3	15		1.3	1.21	407.6	274	50	44	251	255	32	7	310	
4	20		1.2	1.12	410.6	277	50	44	251	250	33	7	309	
5	25		1.1	1.02	413.3	272	50	44	250	250	35	7	310	
6	30	1202	.93	.86	415.912	265	50	44	252	255	35	7	309	0.002 @ 10"
					17.407									
														104.5 %I
														11.5 %M
														713000 SCFM
														64.4 Vm
														1.8 m3
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			~~1.03770~~	1.00708	65.190	285.5	46.60	250/254	250/262	36	7			
			1.03770	Avg Sqrt Del H .9920	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

RCD

KS Thimble # 21
265.8

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	IN
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Inlet
Sample Date	3/28/00
Baro. Press (in Hg)	28.50
Operator	R.E.D.

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		155
Silica gel (g)		13.7
CO2, % by Vol	14	14.4
O2, % by Vol	6	5.2
Temperature (°F)		
Meter Temp (°F)	47	
Static Press (in H_2O)	-15.0	-15.0
Ambient Temp (°F)	31	

Meter Box ID	13
Meter Box Y	.9926
Meter Box Del H	1.9718
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P305
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.195
Area of Stack (ft^2)	265.8 BMT
Sample Time	120 min
Total Traverse Pts	24

Leak Checks

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.000		0.002
Leak Check @ (in Hg)	15		10
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check

	Pre-Test Set	Post-Test Set
Meter Box Temp	44	43
Reference Temp	43	43
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

K Factor

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1325			416.550									
A 1	5		1.5	1.41	419.8	306	46	44	251	260	28	4	259	K = .94
2	10		1.5	1.41	423.1	311	48	44	253	259	30	4	265	
3	15		1.5	1.41	426.3	306	49	43	253	260	30	4	266	
4	20		1.2	1.13	429.2	300	50	43	254	258	29	4	269	
5	25		1.0	0.94	431.9	302	50	43	253	250	28	4	279	
6	30	1355	.98	.92	434.620	296	50	43	253	255	28	4	287	
					18.170									
	0	1407	—	—	434.700	—	—	—	—	—	—	—	—	
B 1	5		1.1	1.03	437.6	282	46	45	250	252	26	4	314	
2	10		1.1	1.03	440.3	285	48	45	251	259	26	4	313	
3	15		1.2	1.13	443.3	292	49	44	250	254	26	5	313	
4	20		.82	.77	445.8	290	49	43	254	261	26	5	311	
5	25		.57	.54	447.8	292	49	44	250	251	25	4	312	
6	30	1457	.60	.56	449.915	291	48	44	251	254	28	5	310	
					15.215									
	0	1530	—	—	450.700	—	—	—	—	—	—	—	—	
C 1	5	~~1530~~ 1535	1.1	1.03	452.8	259	46	45	250	251	25	5	319	
2	10		1.1	1.03	455.7	259	47	45	252	257	23	5	317	
3	15		1.2	1.13	458.6	266	48	45	252	258	23	6	316	
4	20		.94	.88	461.1	265	49	45	250	256	~~23~~ 24	6	315	
5	25		.72	.68	463.6	261	49	45	251	257	24	5	313	
6	30	1600	.70	.66	465.765	250	48	45	253	260	24	5	311	
					15.760									
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

Ontario Hydro Method

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Inlet
Operator: P.E.D.
Run No.: 3
Date: 3/28/00
K Factor: .94

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1628			465.860									
D 1	5		1.3	1.22	469.0	252	47	45	250	252	26	5	314	
2	10		1.3	1.30	472.1	253	47	44	250	258	24	6	313	K=1.00
3	15		1.2	1.20	475.1	258	48	44	252	255	23	6	313	
4	20		1.3	1.30	478.3	261	49	43	253	251	23	6	312	
5	25		1.1	1.10	481.2	259	50	43	252	252	24	6	310	
6	30	1658	.88	.88	483.827	255	49	42	250	254	23	6	311	
					17.967									0.002@10"
														106.8 %I
														10.7 %m
														719880
														66.35 Vm
														1.88 Am³
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			1.03077	1.02875	67.112	277.1	46.1	250/254	250/261	30	6	319		
				Avg Sqrt Del H 1.00594	Comments:									

WESTON MANAGERS DESIGNERS/CONSULTANTS

Determination of Stack Gas Velocity - Method 2

Client DOE MP
Location/Plant
Source Unit 4 Duct A

Operator JRP
Date 3-27-00
Pitot Tube/Thermo ID P112

Pitot Coeff (Cp) 0.54
Stack Area, ft² (As) 26.58

WO #20009-011-006-1

As 287.3

Amb 32°F

Run Number	1	2	~~2~~ 3
Time	1858	911 3/28/00	1400 ~~10-16-3-28-00~~
Barometric Press, in Hg (Pb)	28.11	28.47	28.50
Static Press, in H_2O (Pstatic)	-18.0	-14.7	-15.2
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

~~3036~~ As

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y N		Leak Check good ? Y N		Leak Check good ? Y N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		1	1	0.87	307	.70	276	.61	276
			2	0.89	309	.50	275	.66	280
			3	0.82	314	.50	278	.64	288
			4	0.77	312	.50	282	.60	291
			5	0.43	310	.70	281	.47	291
			6			.46	270	.40	282
		2	1	0.83	311	.57	276	.56	280
			2	0.78		.66	275	.56	288
			3	0.76		.69	283	.49	295
			4	0.57		.54	286	.50	295
			5	0.50		.40	283	~~.30~~ .48	292
			6	0.38		.40	280	.40	287
		3	1	0.70		.65	280	.39	~~29~~ 301
			2	0.81		.70	288	.66	307
			3	0.68		.68	296	.50	307
			4	0.38		.45	296	.25	305
			5	0.25		.22	297	.15	305
			6	0.16		.37	260	.32	298
		4	1	0.98		.74	306	.61	~~315~~ 315
			2	1.00		.80	303	.68	318
			3	0.93		.85	306	.67	317
			4	0.84		.74	304	.60	314
			5	0.67		.62	305	.47	313
			6	0.50		.57	290	.38	314
Avg Angle		avg√DeltaP & Temp		.80531	310.5	.78434	286.6	~~.70053~~	~~298.3~~
Average gas stream velocity, ft/sec.								0.70214	
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min				~~5778500~~ 545000					

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

Method2

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SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Location: UNIT 4 Inlet

Run No. 1 | Sample Date 3/27/00 | Recovery Date 3/27/00

Sample I.D. MPBW - U4 - IN - 1 - OHM - 20MAR2000 | Analyst EERC | Filter Number #19 thimble

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	828.3	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	~~[illegible]~~	757.3	698.7	709.3	616.6	703.8	751.2	5065.2	993.1	6058.3
~~Initial~~ (10:00)	~~753.2~~ 100	~~704.6~~ 100	~~702.0~~ 100	~~642.4~~ 100	~~738.3~~ 100	~~733.7~~ 100	~~726.8~~ 100	~~4981.0~~	~~967.7~~ 300	~~5943.7~~
~~Gain~~ initial	723.3	722.0	697.9	706.3	616.1	703.5	751.4	4915.5	980.6	5896.1
Gain	105	35.3	5.8	3	0.5	0.3	-.2	149.7	12.5	162.2

Impinger Color: | Labeled? ✓

Silica Gel Condition: 1/5 pink | Sealed? ✓

Run No. 2 | Sample Date 3/28/00 | Recovery Date 3/28/00

Sample I.D. MPBW - U4 - IN - 2 - OHM - 20MAR2000 | Analyst EERC | Filter Number

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	817.2	768.6	702.8	726.2	703.5	725.0	734.3	5177.6	864.4	6042.0
Initial	714.5 100	721.1 100	693.2 100	721.9 100	702.9 100	724.5 100	734.4 100	5012.5	852.0 300	5864.5
Gain	102.7	47.5	9.6	4.3	0.6	0.5	-0.1	165.1	12.4	~~178.0~~ 177.5

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: 1/4 pink | Sealed? ✓

Run No. 3 | Sample Date 3/28/00 | Recovery Date 3/28/00

Sample I.D. MPBW - U4 - IN - 3 - OHM - 20MAR2000 | Analyst EERC | Filter Number

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	819.9	771.6	727.5	744.4	693.0	698.3	623.4	5078.1	979.8	6057.9
Initial	730.2 100	722.1 100	716.0 100	741.1 100	692.6 100	698.8 100	623.3 100	4923.1	966.1 300	5889.2
Gain	89.7	49.5	11.5	3.3	0.4	-0.5	1.1	155	13.7	168.7

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: 1/3 pink | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Run 2

Client	DOE	W.O. #	20009.011.006.1100
Location/Plant	MP BOSWELL	Source & Loaction	UNIT 4 Inlet

Run No. BT Sample Date 3/28/00 Recovery Date 3/28/00

Sample I.D. MPBW - U4 - IN - BT - OHM - 20MAR2000 Analyst EERC Filter Number 18

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	726.1	718.1	704.5	724.3	710.5	745.0	626.2	4954.7	978.3	5933
Initial	726.1 100	718.1 100	704.5 100	724.3 100	710.5 100	745.0 100	626.2 100	4954.7	978.8 300	5933.5
Gain	0	0	0	0	0	0	0	0	-.5	-.5

Impinger Color all clear except KMnO4 Labeled? ✓

Silica Gel Condition ok Sealed? ✓

Run No. ___ Sample Date ___ Recovery Date ___

Sample I.D. ___ Analyst ___ Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ Labeled? ___

Silica Gel Condition ___ Sealed? ___

Run No. ___ Sample Date ___ Recovery Date ___

Sample I.D. ___ Analyst ___ Filter Number ___

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color ___ Labeled? ___

Silica Gel Condition ___ Sealed? ___

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Source Gas Analysis Data Sheet - Method 3

Client DOE

Analyst KSA

Location/Plant Boswell

Date 3-27-00

Source Unit 4 Inlet

Analytical Method ~~(circle one)~~ O-SAT

W.O. Number

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.0	19.6	5.6	
2		14.0	19.6	5.6	
3		14.0	19.6	5.6	
	Average	14.0		5.6	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.4	19.6	5.2	
2		14.4	19.6	5.2	
3		14.4	19.6	5.2	
	Average	14.4		5.2	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.4	19.6	5.2	
2		14.4	19.6	5.2	
3		14.4	19.6	5.2	
	Average	14.4		5.2	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

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Method3

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client: Ive Minn Power
Loaction/Plant: Roswell Plant
Source: Unit 4 ESP outlet
Operator: Mills
Date: 3/28/00
W.O. Number: 2008.011.006

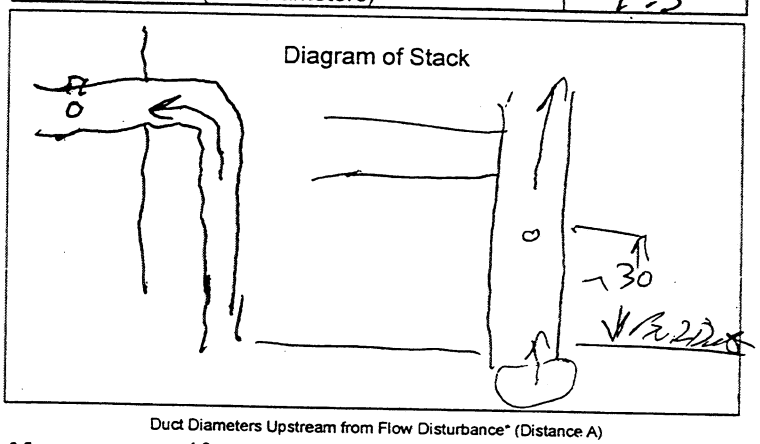
Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type
Traverse Type	☐ Particulate Traverse	☒ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	94 3/4
Port Depth (in.) = D	14 1/4
Depth of Duct, diameter (in.) = C-D	80 1/2
Area of Duct (ft^2)	34.91
Total Traverse Points	16
Total Traverse Points per Port	8

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	

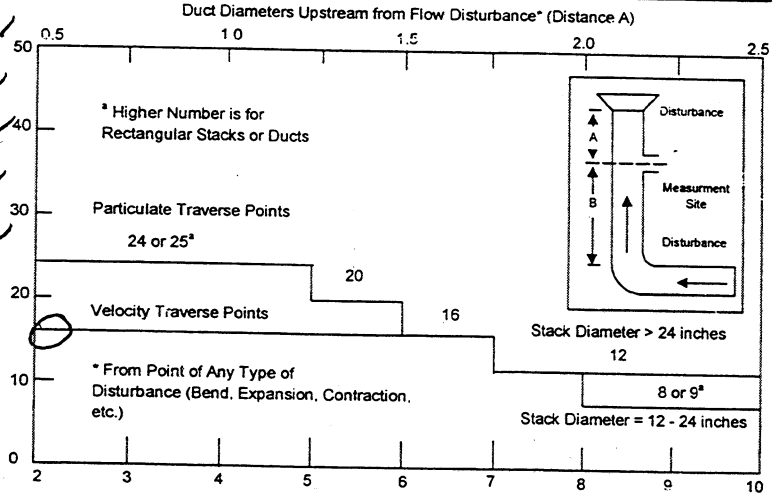
Flow Disturbances	
Upstream - A (ft)	3'
Downstream - B (ft)	30'
Upstream - A (duct diameters)	<1.0
Downstream - B (duct diameters)	4.5

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	0.032	2.58	16.584	16 5/8
2	0.105	8.478	22.478	22 1/2
3	0.194	15.665	29.665	29 5/8
4	0.323	26.087	40.087	40 7/8
5	0.677	54.667	68.667	68 5/8
6	0.806	65.085	79.085	79 1/8
7	0.895	72.272	86.271	86 1/4
8	0.968	78.166	92.166	92 1/8
9				
10				
11				
12				



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client: DOE MP
Loaction/Plant: Unit 4
Source: Stack

Operator: Mills
Date: 3/25/00
W.O. Number: 20009.011.006.

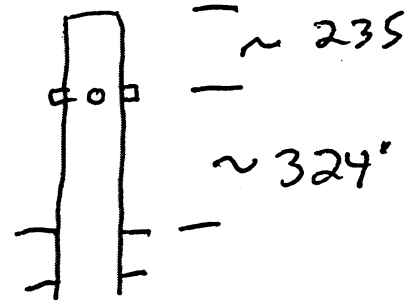
Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	469
Port Depth (in.) = D	21 21
Depth of Duct, diameter (in.) = C-D	448"
Area of Duct (ft^2)	1094.64
Total Traverse Points	12
Total Traverse Points per Port	4

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	

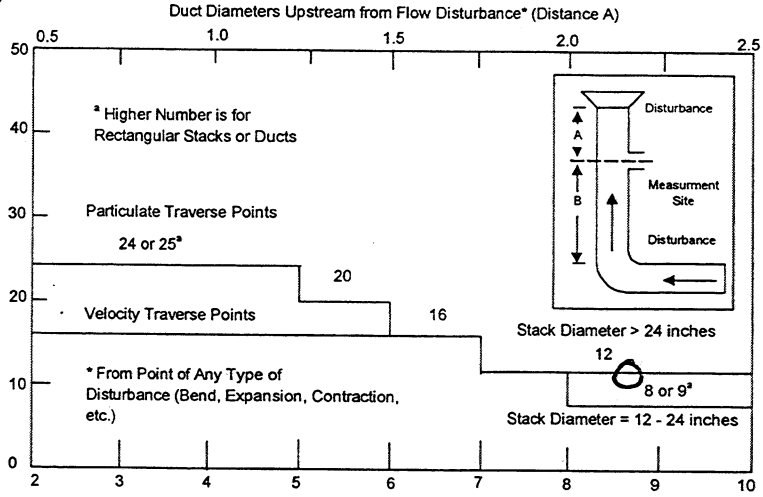
Flow Disturbances	
Upstream - A (ft)	235'
Downstream - B (ft)	324'
Upstream - A (duct diameters)	6.3
Downstream - B (duct diameters)	8.7

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	~~.067~~ .044	19 3/4"	40 3/4
2	.146	65 1/2	86 1/2
3	.296	132 5/8	154
4			
5			
6			
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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Method1.xls

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Determination of Stack Gas Velocity - Method 2

Client: DOE
Location/Plant: UNIT 4
Source: SOTAL

Operator: MLW
Date: 3/2/00
W.O. Number:

Pitot Coeff (Cp): .840
Stack Area, ft² (As): 1094.64
Pitot Tube/Thermo ID: P307

Run Number	Pretest		
Time	1255-1377		
Barometric Press, in Hg (Pb)	28.28		
Static Press, in H_20 (Pstatic)	+0.60		
Source Moisture, % (BWS)	13		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? O / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	.20	147				
0	—		2	.21	147				
0	—		3	0.18	150				
		B	1	0.18	146				
0	—		2	0.21	148				
0.02	<5		3	0.16	150				
0	—	C	1	0.18	147				
0	—		2	0.18	150				
0.01	<5		3	~~0.18~~ 0.16	151				
.01	<5	D	1	0.22	145				
0	—		2	0.18	149				
0	—		3	0.15	151				
						13.7 %w			
								1242400	SCFM
Avg Angle		Avg Delta P & Temp		.18417	1484				
		avg √DeltaP		.42845					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments

CK. MSB.

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Determination of Moisture Content in Stack Gases - Method 4

Client: DOE - MP
Location/Plant: UNIT 4
Source: STACK
W.O. Number: 20009 011 006

Operator: MLG
Meter Box ID: WC 9
Temperature °C or °F: 70

Date: 3/25/00
Meter Box Y: 1.0072
Sample Volume, ft³ or L: 1 ft³

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1										Initial 0.000 @ 10⁻¹
	End Test	1245	092.079	[illegible]	78	1.2	136	313.4		Final 0.000 @ 10⁻¹
Baro Press., Pb (in Hg)	Start Test	1220	86.410	75	73	1.2	100	300	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
28.26	Avg. or Total	25	15.669	78.25		1.2	36	13.4		13.69

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Meter Temp (or ambient temp for rotometer) Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °I
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percen

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

CK. RSB.

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Filter #3

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	OUT
Run No.ID	1
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Outlet
Sample Date	3/27/00
Baro. Press (in Hg)	28.11
Operator	M.L.S

Stack Conditions

	Assumed	Actual
% Moisture	13	
Impinger Vol (ml)		257.9
Silica gel (g)		27.5
CO2, % by Vol	12	14.4
O2, % by Vol	6	5.2
Temperature (°F)	156	
Meter Temp (°F)	93	
Static Press (in H_2O)	+.4	+.43
Ambient Temp (°F)	75	

Meter Box ID	WC 9
Meter Box Y	1.0072
Meter Box Del H	1.89
Probe ID / Length	13.5'
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	.327
Avg Nozzle Dia (in)	.327
Area of Stack (ft^2)	1092.64
Sample Time	120
Total Traverse Pts	12

K Factor 9.32

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.004		.005
Leak Check @ (in Hg)	15		13
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	73	72
Reference Temp	74	73
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1700			~~0.086~~									
D 1	5		0.24	2.23	26.8	154	89	88	253	252	62	4	251	
1	10		0.23	2.14	31.3	156	92	88	254	257	59	4	251	
2	15		0.24	2.23	35.4	158	96	89	241	250	57	5	254	
2	20		0.23	2.14	39.7	159	98	89	241	245	56	5	252	
3	25		0.20	1.87	43.4	157	99	90	239	234	57	5	251	
3	30	1730	0.21	1.96	47.325	158	100	91	240	238	57	6	251	
					24.237							leak check Good @ 10 in VAC		
	0	1817	—	—	48.558	—	—	—	—	—	—	—	—	
C 1	5		0.21	1.96	52.4	149	90	89	247	251	63	4	252	
1	10		0.20	1.87	56.2	148	93	89	253	246	59	4.5	251	
2	15		0.21	1.96	60.1	147	96	89	251	251	57	5	251	
2	20		0.22	2.05	64.2	150	97	90	246	250	55	6	251	
3	25		0.20	1.87	67.8	151	98	90	237	249	59	6.5	251	
3	30	1847	0.19	1.77	71.540	151	99	91	235	241	60	6.5	252	
					22.990							leak check Good @ 12 in VAC		
B	0	1916	—	—	71.776	—	—	—	—	—	—	—	—	
	5		0.22	2.05	75.8	151	90	89	252	255	64	8.0	251	
	10		0.22	2.05	80.0	154	93	89	256	257	62	7.0	252	
	15		0.20	1.87	84.0	153	95	89	249	244	60	7.0	251	
	20		0.21	1.96	87.5	144	96	90	245	243	61	7.5	251	23.297
	25		0.20	1.87	91.4	153	97	90	245	239	65	8.0	251	
	30	1946	0.18	1.68	95.073	153	98	90	244	243	66	8.0	251	leak check - Good @ 14
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

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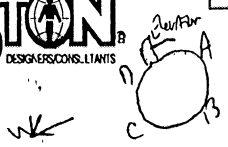

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Outlet
Operator: Mills
Run No.: 1
Date: 3/27/00
K Factor: 9.32

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	~~0816~~			95.338									
A	5	2016	0.18	1.68	98.9	152	90	89	252	255	64	9.0	251	
	10		0.18	1.68	102.5	155	93	89	251	248	59	8.0	251	
	15		0.19	1.78	106.4	153	94	89	249	252	55	8.5	251	
	20		0.19	1.78	109.9	156	96	89	247	260	54	8.5	251	
	25		0.17	1.58	113.8	155	97	90	241	251	57	7.5	252	
	30	~~0816~~	0.16	1.50	117.135	156	97	90	242	239	61	7.5	251	
		2046			21.797									
														101 % I
														13.8 % m
														1,300,000.
														SCFM
														83.9 % m
														2.37 m3
			Avg Sqrt Delta P: 0.45033	Avg Delta H: 1.89708	Total Volume: 92.321	Avg Ts: 153.0	Avg Tm: 92.3		Min/Max: 235/256	Min/Max: 234/260	Max Temp: 66	Max Vac: 9	Max Temp: 252	
				Avg Sqrt Del H: 1.37559	Comments:									

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✓ TB.

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	OUT
Run No.ID	2
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Outlet
Sample Date	3/28/00
Baro. Press (in Hg)	28.47
Operator	M.Ills

Stack Conditions

	Assumed	Actual
% Moisture	13	
Impinger Vol (ml)		230.8
Silica gel (g)		21.3
CO2, % by Vol	14	14.2
O2, % by Vol	5	5.6
Temperature (°F)	152	
Meter Temp (°F)	95	
Static Press (in H_2O)	+.45	+.69
Ambient Temp (°F)	93	

Meter Box ID	WC 9
Meter Box Y	1.0072
Meter Box Del H	1.8932
Probe ID / Length	13'
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	302
Area of Stack (ft^2)	1094.64
Sample Time	120
Total Traverse Pts	12

K Factor 6.81

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.008	.004	.004
Leak Check @ (in Hg)	15	~~10~~ 9	10
Pitot good	(yes) / no	yes / no	(yes) / no
Orsat good	(yes) / no	yes / no	(yes) / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	71	71
Reference Temp	72	72
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	0837			114.733									
D	5		0.21	1.43	123.1	152	79	77	245	245	63	3	251	
	10		0.22	1.50	126.5	155	82	77	242	239	58	3	251	
	15		0.19	1.29	129.7	155	85	78	240	242	55	3	251	
	20		0.21	1.43	132.9	154	87	79	237	248	54	3	252	
	25		0.18	1.22	136.1	154	89	81	236	245	54	3	251	
	30	0907	0.19	1.29	139.22	154	91	82	234	252	55	3	251	
					19.489									
											Leak Check Good @ 10 in VAC			
C	0	0934	—	—	139.413	—	—	—	—	—	—	—	—	
	5		0.23	1.57	142.9	150	86	84	239	246	61	4	251	
	10		0.22	1.50	146.4	154	90	84	249	251	58	4	251	
	15		0.21	1.43	149.8	154	91	85	245	237	55	4	251	
	20		0.21	1.43	152.8	155	92	86	238	252	53	4	251	
	25		0.20	1.36	156.3	155	93	86	240	248	54	4	252	
	30	1004	0.18	1.22	159.410	153	94	87	238	245	57	4	251	
					19.997									
											Leak Check Good @ 9 in VAC			
B	0	1037	—	—	159.645	—	—	—	—	—	—	—	—	
	5		0.22	1.50	163.1	152	87	86	256	250	62	5	251	
	10		0.22	1.50	166.6	153	~~87~~ 90	87	256	248	57	5	251	
	15		0.21	1.43	169.6	154	92	87	241	245	55	5	251	
	20		0.21	1.43	173.3	154	92	87	241	247	55	5	251	
	25		0.18	1.22	176.4	155	94	88	242	250	57	5	~~254~~ 251	
	30	1102	0.17	1.16	179.506	154	94	88	242	253	60	5	~~254~~ 252	
					19.861									
												Leak Check Good @ 10 in VAC		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Outlet
Operator: Mills
Run No.: 2
Date: 3/28/00
K Factor: 6.81

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1130			179.670									
A	5		0.20	1.36	182.9	152	88	86	240	243	64	5	251	
	10		0.20	1.36	186.2	155	92	87	249	257	61	5	251	
	15		0.19	1.29	189.4	155	92	87	240	249	61	5	251	
	20		0.21	1.43	192.8	155	94	88	241	240	63	5.5	251	
	25		0.18	1.22	195.9	155	95	88	240	235	65	5	251	
	30	1200	0.16	1.09	199.89	155	96	89	240	250	66	5	251	
					19.19									
			✓	✓		✓		✓	✓	✓	✓	✓		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			0.446759	1.36083	78.466	153.92	87.48		234/256	235/257	66	5.5		
				Avg Sqrt Del H	Comments:									

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ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client	DOE
W.O.#	20009.011.006.1100
Project ID	MPBW
Mode/Source ID	U4
Samp. Loc. ID	OUT
Run No.ID	3
Test Method ID	OHM
Date ID	20MAR2000
Source/Location	UNIT 4 Outlet
Sample Date	3/28/00
Baro. Press (in Hg)	28.50
Operator	JP TB, MILLS

Stack Conditions

	Assumed	Actual
% Moisture	13	
Impinger Vol (ml)		270.0
Silica gel (g)		21.6
CO2, % by Vol	14	12.8
O2, % by Vol	5	6.0
Temperature (°F)	154	
Meter Temp (°F)	90	
Static Press (in H_2O)	-1.5	-1.79
Ambient Temp (°F)	74	

Meter Box ID	WC 9
Meter Box Y	1.0072
Meter Box Del H	1.8532
Probe ID / Length	13'
Probe Material	~~Boro~~ TFE
Pitot / Thermocouple ID	P301
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	.302
Area of Stack (ft^2)	194.64
Sample Time	120
Total Traverse Pts	12

K Factor 6.81

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.006	.006	.005
Leak Check @ (in Hg)	15	10	11
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	72	72
Reference Temp	74	73
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1325			199.335									
D	5		0.21	1.43	202.8	152	87	86	254	245	64	3	251	
	10		0.21	1.43	205.9	155	89	87	249	254	60	2.5	251	
	15		0.20	1.36	209.3	157	92	87	250	254	59	2.5	251	
	20		0.21	1.43	212.5	156	93	87	244	257	57	3	252	
	25		0.17	1.16	215.7	156	94	87	242	255	55	3	252	
	30	1355	0.16	1.09	218.580	155	95	89	242	245	54	3	251	
					19.245					leak check good @ 9 in VAC				
C	0	1416	—	—	218.573	—	—	—	—	—	—	—	—	
	5		0.22 ~~0.23~~	~~1.57~~ 1.50	222.4	155	90	89	249	240	62	3.5	251	
	10		0.22	1.50	225.9	157	91	89	250	242	54	3.5	251	
	15		0.21	1.43	228.9	158	94	89	247	240	50	3.5	251	
	20		0.20	1.36	232.4	157	95	90	245	252	50	3.5	252	
	25		0.18	1.22	235.5	158	96	90	245	242	51	4.0	251	
	30	1456	0.18	1.22	238.542	157	97	91	243	254	51	4.0	251	
					19.569									
B	0	1530	—	—	238.940	—	—	—	—	—	—	—	—	
	5		0.21	1.43	242.3	155	89	89	251	251	61	4.5	251	
	10		0.22	1.50	245.7	156	91	89	248	251	57	4.5	251	
	15		0.21	1.43	249.0	159	93	89	248	258	53	4.5	253	
	20		0.20	1.36	252.2	159	94	89	243	262	53	4.5	252	
	25		0.18	1.22	255.4	159	95	89	242	247	54	4.5	251	
	30	1600	0.17	1.16	258.418	157	96	90	243	246	57	4	252	leak check good @ 8 in VAC
			Avg Sqrt Delta P	Avg Delta H	Total Volume 19.478	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

Ontario Hydro Method

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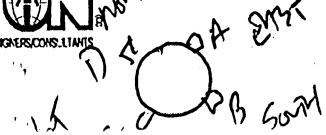

ISOKINETIC FIELD DATA SHEET

Ontario Hydro Method - Mercury

Client: DOE
Source: UNIT 4
Sample Loc.: Outlet
Operator: Mills / JP / TB
Run No.: 3
Date: 3/28/00
K Factor: 6.87

Heated Line

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1628			258.759									
A	5		0.20	1.36	262.0	154	90	88	250	231	65	5.0	251	
	10		0.21	1.43	265.3	156	91	89	247	234	61	5.0	251	
	15		0.20	1.36	268.6	156	94	89	246	237	60	5.0	251	
	20		0.20	1.36	271.9	157	96	90	238	234	62	5.0	252	
	25		0.17	1.16	274.9	157	97	90	239	236	63	5.0	252	
	30	1650	0.16	1.09	277.200	157	98	91	239	240	67	5.0	251	
					18.441									
			Avg Sqrt Delta P 0.441997	Avg Delta H 1.33291	Total Volume 76.733	Avg Ts 156.5	Avg Tm 91.04		Min/Max 238/254	Min/Max 231/242	Max Temp 67	Max Vac 5	Max Temp	
				Avg Sqrt Del H 1.153127	Comments:									

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Determination of Stack Gas Velocity - Method 2

Client: DOE MP
Location/Plant: UNIT 4
Source: ~~INLET~~ ESP
Operator: Fowler
Date: 3/27/00
Pitot Tube/Thermo ID: P139
Pitot Coeff (Cp): .340
Stack Area, ft² (As): 34.91

Run Number	1	2	
Time	2130	1014 3-28-00	
Barometric Press, in Hg (Pb)	28.11		
Static Press, in H_2O (Pstatic)	-8.8	-8.8	
Source Moisture, % (BWS)	10		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		1	1	~~0.43~~	654	0.43		0.39	601
			2	~~0.50~~	658	0.47		0.41	602
			3	~~0.56~~	660	0.52		0.40	603
			4	~~0.43~~	661	0.37		0.37	604
			5	~~0.41~~	664	0.38		0.31	601
			6	0.44	663	0.47		0.32	602
			7		663	0.40		0.28	595
			8		662	0.37		0.30	600
		2	1		646	0.41		0.35	601
			2		654	0.40		0.33	602
			3		662	0.41		0.37	602
			4		662	0.35		0.32	603
			5		662	0.33		0.33	601
			6		657	0.33		0.33	601
			7		651	0.28		0.31	601
			8		655	0.25		0.31	601
					658.7	.61958		.5817	601.3
					42400 SCFM				
					111000 ACFM				

Avg Angle		avg√DeltaP & Temp			
Average gas stream velocity, ft/sec.					
Vol. flow rate @ actual conditions, wacf/min					
Vol. flow rate at standard conditions, dscf/min					

$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$

$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$

$Qs(act) = 60 * Vs * As$

$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

Method2

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Determination of Stack Gas Velocity - Method 2

Client		Operator		Pitot Coeff (Cp)	
Location/Plant		Date		Stack Area, ft^2 (As)	
Source		W.O. Number		Pitot Tube/Thermo ID	P139

Run Number			3
Time			1506 3-28-00
Barometric Press, in Hg (Pb)			28.5
Static Press, in H_20 (Pstatic)			-8.8
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at O°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		1	1					0.33	614
			2					0.32	615
			3					0.37	615
			4					0.30	618
			5					0.36	615
			6					0.33	617
			7					0.32	617
			8					0.27	617
		2	1					0.35	609
			2					0.35	612
			3					0.35	616
			4					0.30	617
			5					0.33	619
			6					0.33	615
			7					0.27	612
			8					0.28	612
								.56725	615
Avg Angle		Avg Delta P & Temp							
		avg $\sqrt{DeltaP}$							
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments _____

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Client: DOE | W.O. #: 20009.011.006.1100
Location/Plant: MP BOSWELL | Source & Location: UNIT 4 Outlet

Run No. 1 | Sample Date 3/27/00 | Recovery Date 3/27/00

Sample I.D. MPBW - U4 - OUT - 1 - OHM - 20MAR2000 | Analyst EERC | Filter Number 3

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	890.1	787.2	723.0	746.5	713.7	738.1	736.8	5335.4	979.0	6314.4
~~Initial~~ void	~~719.5~~ 100	~~700.3~~ 100	~~727.4~~ 100	~~716.7~~ 100	~~745.4~~ 100	~~753.1~~ 100	~~727.4~~ 100	~~5089.8~~	~~1008.1~~ 300	~~6097.9~~
~~Gain~~ initial	718.7	721.8	707.4	740.9	714.1	735.9	738.7	5077.5	951.5	6029.0
Gain	171.4	65.4	15.6	5.6	-.4	2.2	-1.9	257.9	27.5	285.4

Impinger Color: 75% pink | Labeled? ✓

Silica Gel Condition: | Sealed? ✓

Run No. 2 | Sample Date 3/28/00 | Recovery Date 3/28/00

Sample I.D. MPBW - U4 - OUT - 2 - OHM - 20MAR2000 | Analyst EERC | Filter Number 21

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	907.8	769.4	731.7	706.8	682.6	721.5	751.5	5271.3	876.3	6147.6
Initial	726.7 100	731.0 100	722.5 100	704.5 100	682.0 100	721.8 100	752.0 100	5040.5	853.0 300	5895.5
Gain	181.1	38.4	9.2	2.3	0.6	-0.3	-0.5	230.8	21.3	252.1

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: 1/4 pink | Sealed? ✓

Run No. 3 | Sample Date 3/28/00 | Recovery Date 3/28/00

Sample I.D. MPBW - U4 - OUT - 3 - OHM - 20MAR2000 | Analyst EERC | Filter Number 16

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O2	KMnO4 ★	KMnO4	KMnO4		Silica Gel	
Final	913.8	768.2	716.9	643.3	631.6	749.4	726.7	5149.9	962.6	6112.5
Initial	736.1 100	726.7 100	709.0 100	640.1 100	630.9 100	749.2 100	727.3 100	4919.3	941.0 300	5860.3
Gain	177.1	~~424.5~~	7.9	3.2	0.7	0.2	-.6	230.0	21.6	~~252.2~~ 251.6

Impinger Color: all clear except KMnO4 | Labeled? ✓

Silica Gel Condition: 1/2 pink | Sealed? ✓

Check COC for Sample IDs of Media Blanks

★ 1st KMnO4 impinger solution yellow-orange in color
also, 1st KCl not capped when returned to be recovered.

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Ontario Hydro Method - Mercury

Run One

Client: DOE | W.O. #: 20009.011.006.1100

Location/Plant: MP BOSWELL | Source & Loaction: UNIT 4 Outlet

Run No. BT | Sample Date 3/27/00 | Recovery Date 3/27/00

Sample I.D. MPBW - U4 - OUT - BT - OHM - 20MAR2000 | Analyst FERC | Filter Number #8

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final	620.2	743.4	726.7	610.2	747.3	727.1	715.2	4890.1	922.2	5812.3
Initial	620.1 100	743.4 100	726.8 100	610.2 100	747.4 100	727.2 100	715.3 100	4890.4	922.3 300	5812.7
Gain	.1	0	-.1	0	-.1	-.1	-.1	-.3	-.1	-.4

Impinger Color _____ | Labeled? _____

Silica Gel Condition ok | Sealed? _____

Run No. ___ | Sample Date ~~3/23/00~~ | Recovery Date _____

Sample I.D. _____ | Analyst _____ | Filter Number _____

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	~~726.7 100~~	~~731.0 100~~	~~723.5 100~~	~~704.5 100~~	~~683.0 100~~	~~721.8 100~~	~~751.9 100~~		~~835.6 300~~	
Gain										

Impinger Color _____ | Labeled? _____

Silica Gel Condition _____ | Sealed? _____

Run No. ___ | Sample Date _____ | Recovery Date _____

Sample I.D. _____ | Analyst _____ | Filter Number _____

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	KCl	KCl	KCl	HNO3/H2O	KMnO4	KMnO4	KMnO4		Silica Gel	
Final										
Initial	100	100	100	100	100	100	100		300	
Gain										

Impinger Color _____ | Labeled? _____

Silica Gel Condition _____ | Sealed? _____

Check COC for Sample IDs of Media Blanks

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Source Gas Analysis Data Sheet - Method 3

Client DOE

Analyst HA

Location/Plant Boswell

Date 3-27-00

Source Unit 4 Stack

Analytical Method (circle one) ORSAT

W.O. Number

Run Number 1

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.4	19.6	5.2	
2		14.4	19.6	5.2	
3		14.4	19.6	5.2	
	Average	14.4		5.2	

Run Number 2

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		14.2	19.8	5.6	
2		14.2	19.8	5.6	
3		14.2	19.8	5.6	
	Average	14.2		5.6	

Run Number 3

Leak Check Good? (circle one) Yes No

Analysis Number	Analysis Time	Percent CO_2 (A)	Percent Total (B)	Percent O_2 (B - A)	Percent N_2 (100 - B)
1		13.8	19.8	6.0	
2		13.8	19.8	6.0	
3		13.8	19.8	6.0	
	Average	13.8		6.0	

Acceptable differences for repeat analysis:

if CO_2 > 4% than +/- 0.3%

if CO_2 < or = 4% than +/- 0.2%

if O_2 > or = 15% than +/- 0.2%

if O_2 < 15% than +/- 0.3%

Ambient Check

Oxygen 20.9

Carbon Dioxide 0.0

Report all values to the nearest 0.1 percent

Comments

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Method3

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Unit 2
Test 1

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 2 Sample Stream: Coal S-1

Date 3/23/00

Increment	1	2	3	4	5	6	7	8
Time	~~1000~~ 1225	~~1020~~ 1250	1315	1340	1505	1520	1540	1605
~~Weigth~~ / Volume	Scoop							
Comp / ~~Grab~~	Comp							
Process Status MW	57	57	57	57	57	57	57	57
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	msb							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Mill	A	B	A	D	A	A	D	A
Increments	2	2	2	2	2	2	3	3

Test ID: Unit # 2 / Test 1
Sample Stream: COAL
Sample ID: S-1-1
Target Size: 5 Gallon Bucket
Sample Device: Scoop
Analysis:
Preservative:
Container: HDPE Bucket
Frequency: 1/20
Safety Issues: Moving Equipment
Protective Gear: Gloves - Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Bag & Bucket
Checked By: ~~Yes~~ msb
Shipped By: OCB
Received By: msb

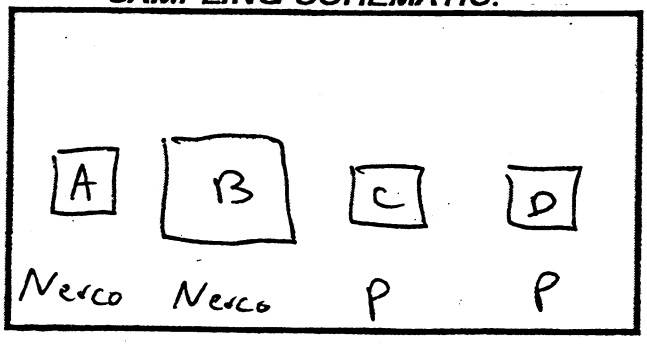
SAMPLING NOTES:

11 Volumes from A - NERCO
7 Volumes from D - Peabody

~ 60% NERCO

~ 40% Peabody

SAMPLING SCHEMATIC:



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2-1

PROCESS STREAM SAMPLING SHEET

Sample Stream: Bashouse Ash S-4

Plant Boswell Unit 2

Date 3/23/00

Increment	1	2	3	4	5	6	7	8
Time	1325	1330	1410	1410	1445	1447	1450	
Weigth / Volume	400 mL	400 mL	400 mL	400 mL	400 mL	400 mL	400 mL	
Comp / ~~Grab~~								
Process Status MW	57	57	57	57	57	57	57	
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Hopper	1	2	4	6	3	7	8	

Test ID: Unit # 2 - Test 1
Sample Stream: COAL
Sample ID: S-4-1
Target Size: 5 Gallon
Sample Device: Thief
Analysis:
Preservative:
Container: Glass Bottle
Frequency: 1 per Test
Safety Issues: Dust.
Protective Gear: Glasses - Long Sleeve Shirt

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

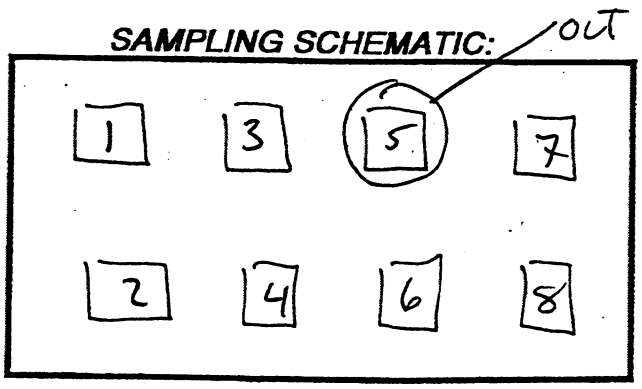
SAMPLING NOTES:

Thief Sample from each hopper

Ash Pulled @ 1300-1330

#5 out of Service
Sample riffled on site to 3 8oz Bottles
(Retainer Stored)

SAMPLING SCHEMATIC:



O:\appres\stack\process

Unit 2
Test 2
Coal

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 2 Sample Stream: COAL- S-1

Date 8/24/00

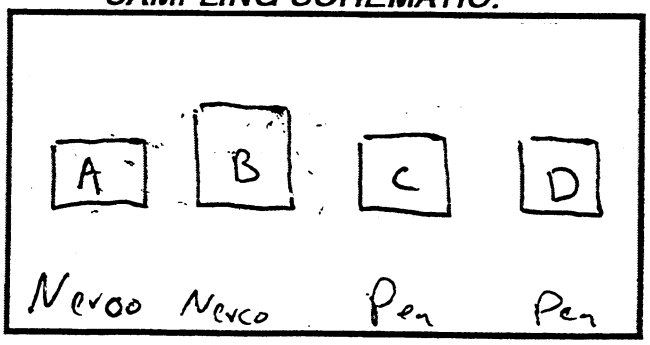
Increment	1	2	3	4	5	6	7	8
Time	0830	0850	0910	0930	0945	1005	1020	1035
~~Weigth~~ / Volume	2-scoops	2-scoops	2-scoops	2-scoops	2-scoops	2-scoops	2-scoops	2-scoops
Comp / ~~Grab~~	Comp							
Process Status MW	56.6	56.7	56.7	56.7	56.7	56.7	56.7	56.7
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
mill	A	D	A	D	A	A	D	A
Increments	2	2	2	2	2	2	2	2

Test ID: Unit 2 - Test 2
Sample Stream: COAL
Sample ID: S-1-2
Target Size: 5 Gal Bucket
Sample Device: Scoop
Analysis:
Preservative:
Container: HDPE Bucket
Frequency: 1/20 min
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Bag & Bucket
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



O:\appres\stack\process

Unit 2
Test 2
Baghouse Ash

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 2 Sample Stream: Baghouse Ash S-4 Date 3/24/00

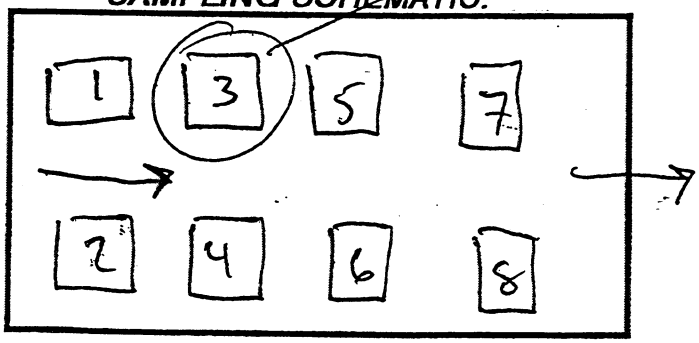
Increment	1	2	3	4	5	6	7	8
Time	1040	1042	1044	1047	1050	1052	1055	
~~Weigth~~ / Volume	~200ml	—	—	—	—	—	—	
Comp / ~~Grab~~	Comp							
Process Status mw	56.7	—	—	—	—	—	—	
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Hopper	1	5	7	8	2	4	6	

Test ID: Unit 2- Test 2
Sample Stream: Baghouse Fly Ash
Sample ID: S-4-2
Target Size: Thief
Sample Device: 1 Gallon
Analysis:
Preservative:
Container: Glass Bottle
Frequency: 3/Test
Safety Issues: Dust
Protective Gear: Glovs- Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



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Unit 2
Test 3
Coal

PROCESS STREAM SAMPLING SHEET

Sample Stream: COAL S-1

Plant Boswell Unit 2

Date 3/24/00

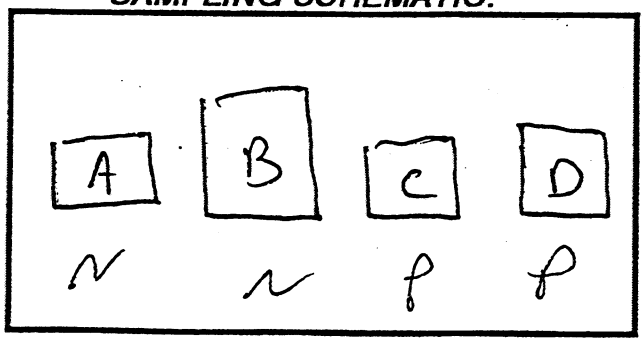
Increment	1	2	3	4	5	6	7	8
Time	1220	1240	1300	1320	1340	1400	1420	1440
~~Weigh~~t / Volume	2-Scoop	—	—	—	—	—	—	—
Comp / ~~Grab~~	Comp							
Process Status MW	56.7	—	—	—	56.7	56.7	56.7	56.7
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD	—	—	—	—	—	—	—
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Mill	A	D	A	D	A	A	D	A
Increments	2	2	2	2	2	2	2	2

Test ID: Unit 2- Test 3
Sample Stream: COAL
Sample ID: S-1-3
Target Size: 5-Gallon Bucket
Sample Device: Scoop
Analysis:
Preservative:
Container: HDPE Bucket
Frequency: 1/20 min
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: ~~Glass, Bottle~~ Bag & Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



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Unit 2
Test 3
Baghouse Ash

PROCESS STREAM SAMPLING SHEET

Sample Stream: Baghouse Ash S-4

Plant Boswell Unit 2

Date 3/24/00

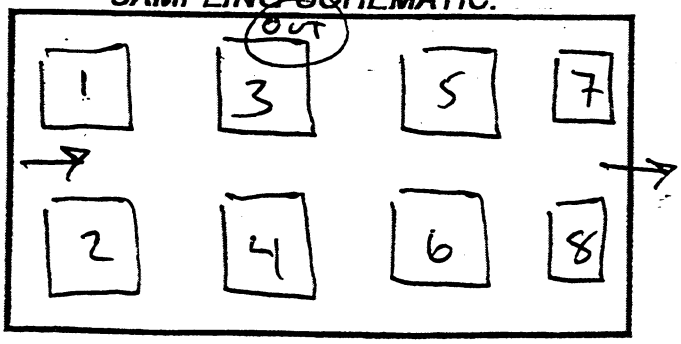
Increment	1	2	3	4	5	6	7	8
Time	1345	1347	1350	1405	1408	1425	1428	
~~Weigth~~ / Volume	~250mL							
Comp / ~~Grab~~	Comp							
Process Status~~MW~~								
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Hopper	1	5	7	2	4	6	8	

Test ID: Unit 2- Test 3
Sample Stream: Baghouse Fly Ash
Sample ID: S-4-3
Target Size: 1 Gallon
Sample Device: Thief
Analysis:
Preservative:
Container: Glass Bottle
Frequency: 3/Test
Safety Issues: Dust
Protective Gear: Gloves- Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



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PROCESS STREAM SAMPLING SHEET

Sample Stream: Coal S-2

Plant Bosmell Unit 3

Date 3-21-00

Increment	1	2	3	4	5	6	7	8
Time	~~900~~ 850	0920	0945	~~1010~~ 1015	1040	1105	1130	1155
Weigth / Volume	5 scoop							
Comp / Grab	Com	Comp	Comp	Comp	Comp	Comp	Comp	Comp
Process Status	339	340	340	339	342	337	337	337
Sampler Condition	✓	✓	✓	✓	✓	✓	✓	✓
Container Condition	✓	✓	✓	✓	✓	✓	✓	✓
Container Label	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampler	MSD	MSD	MSD	MSD	MSD	MSD	MSD	MSD
Sample Stored	✓	✓	✓	✓	✓	✓	✓	✓
pH (if required)								
Temperature								
Preservative								
mw	338							
Feeder	B	C	D	E	B	C	D	E

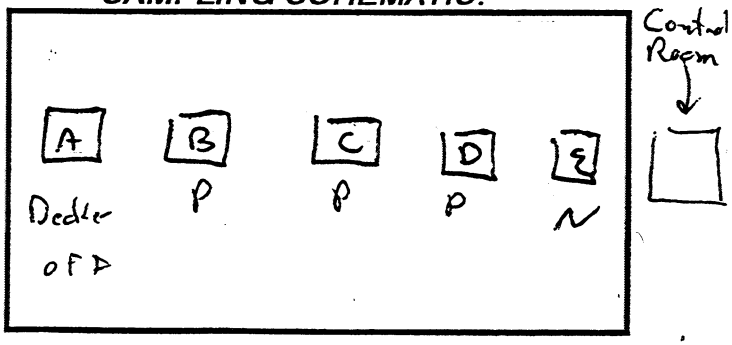
Test ID: Unit #3 - Test 1
Sample Stream: Coal - S-2
Sample ID:
Target Size: 1-5 gal Bucket
Sample Device: Steel Tube
Analysis:
Preservative: None
Container: HDPE - Bucket
Frequency: 1/3 min
Safety Issues: Dust - Heat
Protective Gear: Gloves - Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Bag & Bucket
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

5 scoops from each Feeder

SAMPLING SCHEMATIC:



3 - 1

PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Over-Spray L-2

Plant Boswell Unit #3

Date 3-21-00

Increment	1	2	3	4	5	6	7	8
Time	0905	0930	0955	1020	1045	1115	1140	1200
Weigth / Volume	500 mL							
Comp / Grab	Comp							
Process Status	339	340	340	339	342	337	337	337
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	MSD							
Sample Stored								
pH (if required)								
Temperature								
Preservative								

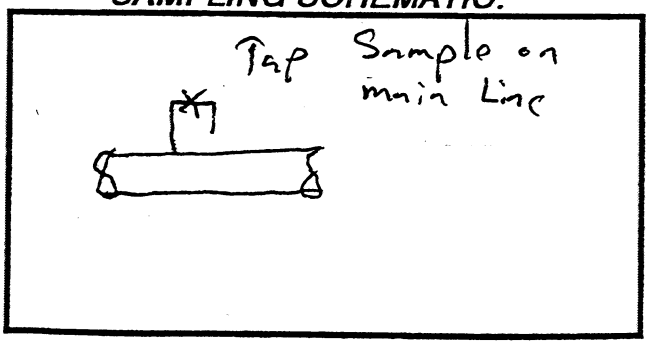
Test ID: Unit 3 - Test 1
Sample Stream: Scrubber Over-Spray (L-2)
Sample ID:
Target Size:
Sample Device: HDPE - Bottle - from Tap
Analysis:
Preservative: HNO_3
Container: HDPE
Frequency: 1/25 min
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle - Ice Chest
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

Increments Composited -
Preserved with HNO_3

SAMPLING SCHEMATIC:



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3 - 1

PROCESS STREAM SAMPLING SHEET

Sample Stream: Particulate Scrubber Slurry S-5 - L-1

Plant Boswell Unit #3 Date 3/21/00

Increment	1	2	3	4	5	6	7	8
Time	0905	0932	0957	1022	1047	1118	1143	1203
~~Weigth~~ / Volume	500 mL							
Comp / ~~Grab~~	Comp							
Process Status MW	339	340	340	339	342	337	337	337
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored								
pH (if required)								
Temperature								
Preservative								
Q-each GPM	5430	5380	5370	5363	5350	5350	5370	5370
Stage GPM	5300	5250	5270	5270	5250	5260	5250	5240

Test ID: Unit #3 - Test 1
Sample Stream: Scrubber Slurry (S-5) (L-1)
Sample ID:
Target Size:
Sample Device: Teflon Dipper
Analysis:
Preservative: HNO_3 for filtrate
Container: HDPE
Frequency: 1/25 min
Safety Issues:
Protective Gear:

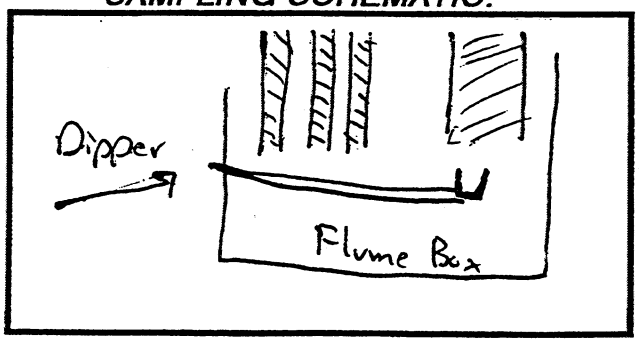
Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle - Ice Chest
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

Sample Increment Composited & filtered - Solids Air dried & stored as S-5 -

Filtrate - retained & preserved as L-1

SAMPLING SCHEMATIC:



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0930

PROCESS STREAM SAMPLING SHEET

Sample Stream: Coal S-2

Plant Boswell Unit 3

Date 3-21-00

Increment	1	2	3	4	5	6	7	8
Time	1505	1530	1555	1620	1645	1710	1730	1750
~~Weigth~~ / Volume	5 scoops							
Comp / ~~Grab~~								
Process Status mw	335	336	336	336	336	336	336	335
Sampler Condition	OK							
Container Condition	OK							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Feeder	E	D	C	B	B	C	D	E

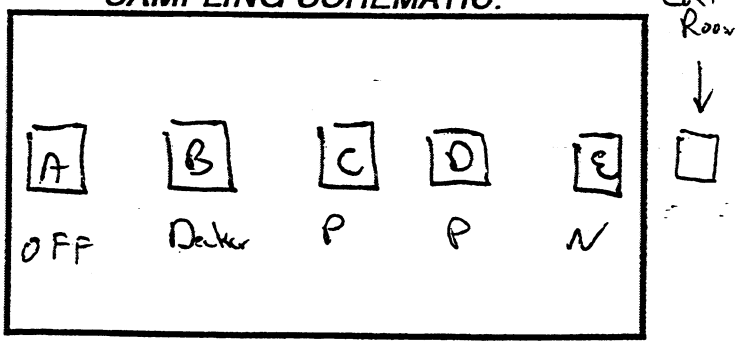
Test ID: Unit #3 - Test 2
Sample Stream: Coal - S-2
Sample ID:
Target Size: 1-5gal Bucket
Sample Device: Steel Tube
Analysis:
Preservative:
Container: HDPE Bucket
Frequency: 1/20 minutes
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Bag & Bucket
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

5- scoops from each Feeder

SAMPLING SCHEMATIC:



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PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Overspray

Plant Boswell Unit 3

Date 3-21-00

Increment	1	2	3	4	5	6	7	8
Time	1510	1530	1600	1625	1650	1715	1732	1758
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~								
Process Status	335	336	336	336	336	336	336	335
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit #3 - Test 2
Sample Stream: Scrubber Over-Spray (2-2)
Sample ID:
Target Size:
Sample Device: HDPE Bottle from Tap
Analysis:
Preservative: HNO_3
Container: HDPE Bottle
Frequency: 1/25 minutes
Safety Issues:
Protective Gear:

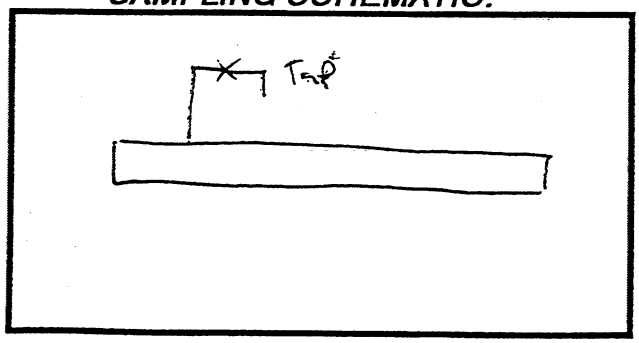
Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle - Ice Chest
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

Increments Composited

Preserved with HNO_3

SAMPLING SCHEMATIC:



PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Slurry

Plant Boswell Unit #3

Date 3/21/00

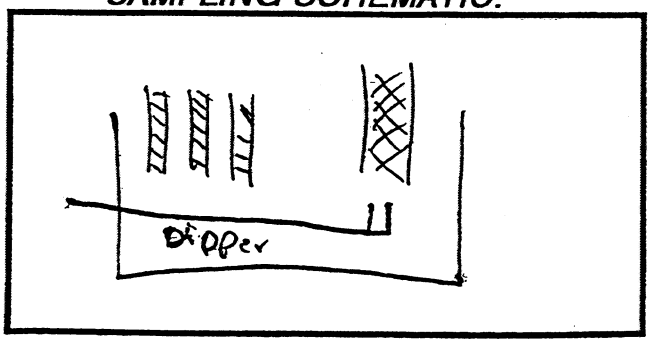
Increment	1	2	3	4	5	6	7	8
Time	1505	1533	1605	1627	1653	1718	1734	1800
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW	336	336	336	336	336	336	336	336
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
~~Ove~~ Quench	5370	5375	5370	5380	5360	5380	5380	5390
1st Stage	5240	5250	5250	5260	5240	5250	5250	5300

Test ID: Unit #3 - Test 2
Sample Stream: Scrubber Slurry (S-5) (L-1)
Sample ID:
Target Size:
Sample Device: Teflon Dipper
Analysis:
Preservative: HNO_3 for filtrate
Container: HDPE Bottle
Frequency: 1/25 minutes
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: ~~Yes~~ HDPE Bottle in Ice Chest
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



3 - 3

PROCESS STREAM SAMPLING SHEET

Plant Bosuell Unit 3 Sample Stream: Coal S-2 Date 3-22-00

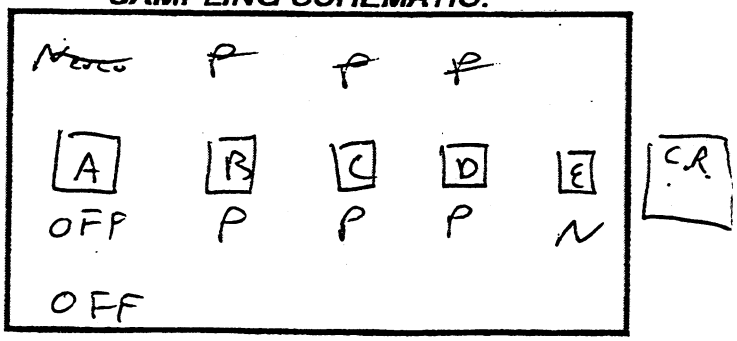
Increment	1	2	3	4	5	6	7	8
Time	0835	0900	0925	0950	1015	1035	1055	1115
~~Weigth~~ / Volume	5-scoop							
Comp / ~~Grab~~	Comp							
Process Status	335	335	337	337	337	337	337	337
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
	E	D	C	B	B	C	D	E

Test ID: Test 3
Sample Stream: Coal S-2
Sample ID:
Target Size: 5 Gallon
Sample Device: Scoop
Analysis:
Preservative:
Container: HDPE Bucket
Frequency: 1/25 min
Safety Issues:
Protective Gear:

Composite Logged? Yes MSD
Sample Stored? Yes MSD
Storage Method: Bag / Bucket
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



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3-3

PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Slurry

Plant Boswell Unit 3

Date 3-22-00

Increment	1	2	3	4	5	6	7	8
Time	0845	0910	0930	1000	1022	1042	1100	1120
~~Weigth~~ / Volume	1000 mL							
Comp / ~~Grab~~	Comp							
Process Status MW	335	335	337	337	337	337	337	337
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Quench GPM	5400	5380	5390	5390	5390	5370	5350	5390
1st Stage GPM	5250	5260	5230	5250	5240	5250	5260	5260

Test ID: Test 3

Sample Stream: Slurry

Sample ID: L-1

Target Size:

Sample Device: Teflon Dipper

Analysis:

Preservative: HNO_3 for Hg

Container: HDPE

Frequency: 1/25

Safety Issues:

Protective Gear:

Composite Logged? Yes

Sample Stored? Yes

Storage Method: HDPE Bottle - Ice Chest

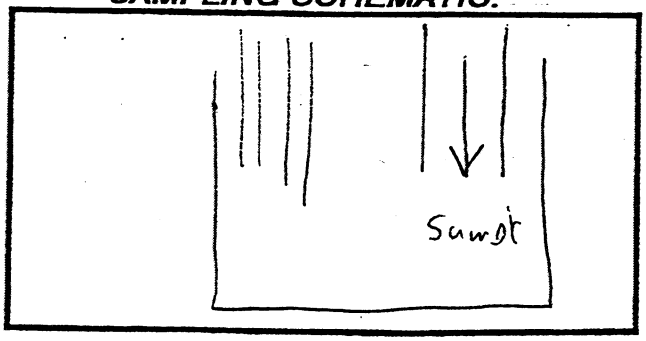
Checked By: MSD

Shipped By: OCB

Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



O:\appres\stack\process

3 - 3

PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Over-Spray

Plant Boswell Unit 3

Date 3-22-00

Increment	1	2	3	4	5	6	7	8
Time	0840	0905	0928	0955	1020	1040	1058	1117
~~Weigth~~ / Volume	500 mL							
Comp / ~~Grab~~	Comp							
Process Status MW	335	335	337	337	337	337	337	337
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	MSD							
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Test 3

Sample Stream: Over Spray L-2

Sample ID:

Target Size:

Sample Device: HDPE Bottle

Analysis:

Preservative: HNO_3 for Hg

Container: HDPE

Frequency: 1/25 min

Safety Issues:

Protective Gear:

Composite Logged? Yes

Sample Stored? Yes

Storage Method: HDPE-Bottle-Ice Chest

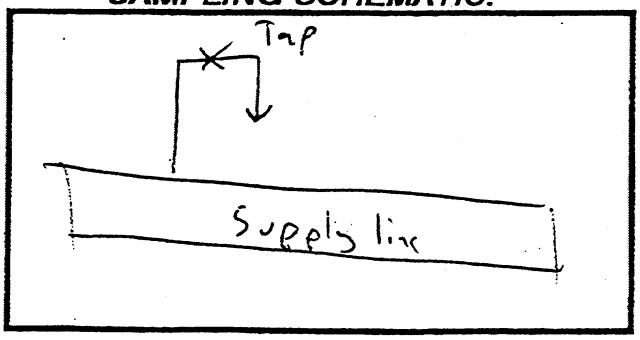
Checked By: MSD

Shipped By: OCB

Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:



O:\appres\stack\process

Unit 4
Test 1
S-3

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 4 Sample Stream: Coal S-3

Date 3/27/00

Increment	1 5pm	2	3	4	5	6	7	8
Time	~~1515~~	5:25	5:55	6:25	6:50	1730	2800	2830
~~Weigth~~ / Volume	6 scoops	6	6	6	6	6	6	6
Comp / ~~Grab~~	Comp	Comp	Comp	Comp	Comp	Comp	Comp	Comp
Process Status MW	566	~~530~~	560	525	560	534	527	532
Sampler Condition	Clean	Clean	Clean	Clean	Clean	Clean	Clean	Clean
Container Condition	New	New	New	New	New	New	New	New
Container Label	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampler	MSD/OCB	MSD	Jr	Jr	OCB	MSD	MSD	MSD
Sample Stored	Yes	Yes	Yes	Yes	Yes	Yes MSD	Yes	Yes
pH (if required)	X							
Temperature	X							
Preservative	X							
Mill	G	F	E	D	C	B	B4 D2	D2 B4
Coal	New D	N	D	D	P	P	N D	D P

Test ID: Unit 4 Test 1
Sample Stream: Coal
Sample ID: S-3-1
Target Size: 5 Gallon
Sample Device: Steel Slotted Sampler
Analysis:
Preservative:
Container: Bag & Bucket
Frequency: 1/30 min
Safety Issues:
Protective Gear: Gloves

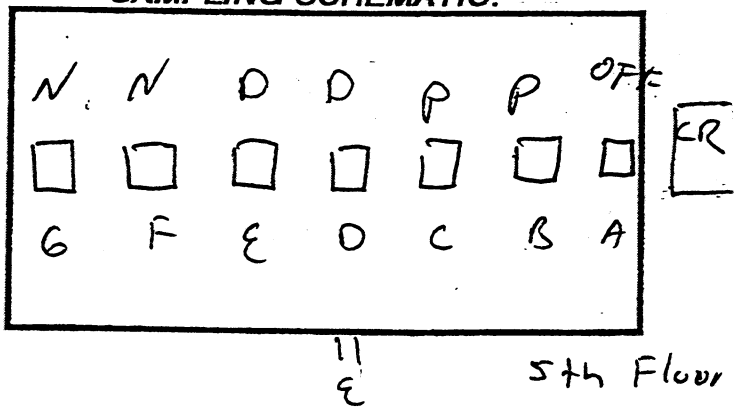
Composite Logged? Yes
Sample Stored? Yes
Storage Method: 5 gal Bucket
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

Western Start Time - 5pm

Stop Time -

SAMPLING SCHEMATIC:



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Unit 4
Test 1
S-7

PROCESS STREAM SAMPLING SHEET

Sample Stream: ESP Ash S-7

Plant Boswell Unit 4 1705 of 32

Date 3/27/00

Increment	1	2	3	4	5	6	7	8
Time	~~1530~~	Started @ 1705 -			Ended	@ →		2020
~~Weigth~~ / Volume								
~~Comp~~ / Grab	~~Grab~~	Composite						
Process Status MW								
Sampler Condition								
Container Condition								
Container Label								
Sampler								
Sample Stored								
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 1
Sample Stream: ESP Ash
Sample ID: S-7-1
Target Size:
Sample Device:
Analysis:
Preservative:
Container:
Frequency: 1 Grab at completion of Test
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Glass Bottle
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

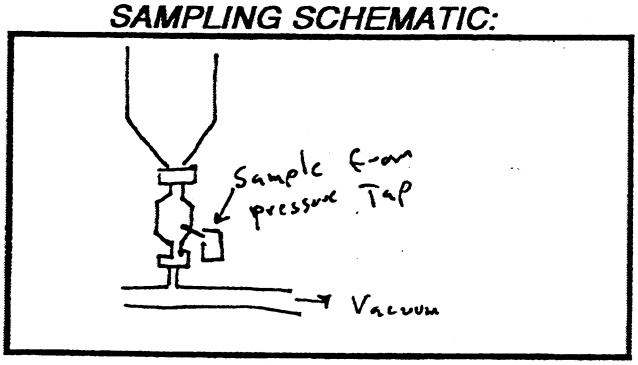
SAMPLING NOTES:

Plant Operators will Take This sample -

EERC to receive sample split

Weston Start @ 1515

SAMPLING SCHEMATIC:



O:\appres\stack\process

Unit 4
Test 1
S-6 & L-3

PROCESS STREAM SAMPLING SHEET

Sample Stream: FGD Slurry

Plant Boswell Unit 4

Date 3/27/00

Increment	1	2	3	4	5	6	7	8
Time	~~1525~~ 1700	1730	1755	1820	1850	1930	~~1800~~ 1900	~~2030~~ 2030
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW	566	560	560	525	560	534	527	532
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	OCB	OCB	MSP	MSD	OCB	OCB	OCB	OCB
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								
Pipe	~~Left~~	~~Right~~						
	Both	Both	Both	Both	Both	Both	Both	Both

Test ID: Unit 4 Test 1
Sample Stream: FGD Slurry
Sample ID: S-6 & L-3
Target Size: 3-4 L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3 for Filtrate
Container: HDPE Bottle
Frequency: 1/30 minutes
Safety Issues:
Protective Gear: Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottles
Checked By: MSP
Shipped By: OCB
Received By: MSD

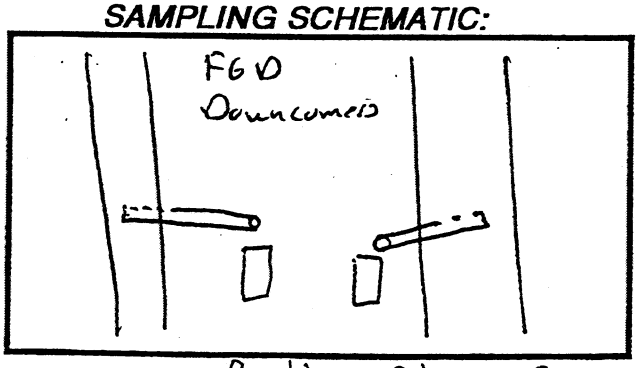
SAMPLING NOTES:

Slurry filtered on site

Filtrate retained and preserved with HNO_3

Solids dried @ ~~100~~ 90 °F for 3 hrs

SAMPLING SCHEMATIC:



Bottom Floor of scrubber Bldg

O:\appres\stack\process

Unit 4
Test 1
L-4

PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Over-Spray L-4

Plant Boswell Unit 4 1708 1735

Date 3/27/00

Increment	1	2	3	4	5	6	7	8
Time	~~1530~~	1735	1800	1825	1850	1930	2000	2030
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW	566	560	560	525	560	534	527	532
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler	OCB	OCB	MSD	MSD	OCB	OCB	OCB	OCB
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 1
Sample Stream: Scrubber Over-Spray
Sample ID: L-4-1
Target Size: 3 L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3
Container: HDPE Bottle
Frequency: 1/30 minutes
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: ~~Gla~~ Plastic HDPE
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:

Tap Sample on 6th floor marked overspray - farthest Tap on Left

O:\appres\stack\process

Unit 4
Test 2
S-3

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 4 Sample Stream: Coal S-3

Date 3/27/00

Increment	1	2	3	4	5	6	7	8
Time	840	0915	0950	1025	1105	1145		
~~Weigh~~ / Volume	7 scoops							
Comp / ~~Grab~~	Comp							
Process Status MW	536	538	538	539	541	538		
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler								
Sample Stored								
pH (if required)								
Temperature								
Preservative								
Mill	6	F	D	C	B	A		
Coal	Peabody	Peabody	Decker	Decker	Nerco	Nerco		

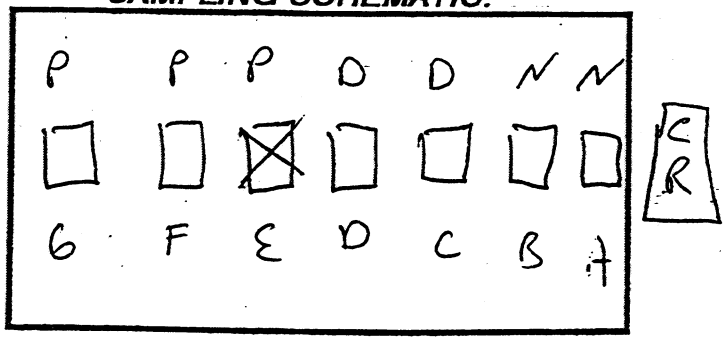
Test ID: Unit 4 - Test 2
Sample Stream: Coal
Sample ID: S-3-2
Target Size: 5 Gallon
Sample Device: Slotted Scoop
Analysis:
Preservative:
Container: Bag & Bucket
Frequency: 1 / 30 min
Safety Issues:
Protective Gear: Gloves

Composite Logged? Yes
Sample Stored? Yes
Storage Method: 5 gal HDPE
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

	Start	Stop
Western Start @	0837	- 0907
2nd Port @	0834	- 1004
3rd Port @	1032	- 1102
4th Port @	11:32	- 1202

SAMPLING SCHEMATIC:



O:\appres\stack\process

Unit 4
Test 2
S-7

PROCESS STREAM SAMPLING SHEET

Sample Stream: ESP Ash S-7

Plant Bowell Unit 4

Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	8:45	on	11:40	off				
Weigth / ~~Volume~~								
~~Comp~~ / Grab	Grab							
Process Status								
Sampler Condition								
Container Condition								
Container Label								
Sampler								
Sample Stored								
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 2
Sample Stream: ESP Ash
Sample ID: S-7-2
Target Size:
Sample Device:
Analysis:
Preservative:
Container:
Frequency: 1 Grab @ Completion of Test
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:

O:\appres\stack\process

Unit 4
Test 2
S-6 & L-3

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 4 Sample Stream: FGD Slurry

Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	8:47	9:15	9:50	10:25	11:00	11:35		
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW								
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler								
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 2
Sample Stream: FGD Slurry
Sample ID: S-6 & L-3
Target Size: 3-4 L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3 for Filtrate
Container: HDPE Bottle
Frequency: 1 / 30 min
Safety Issues:
Protective Gear: Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

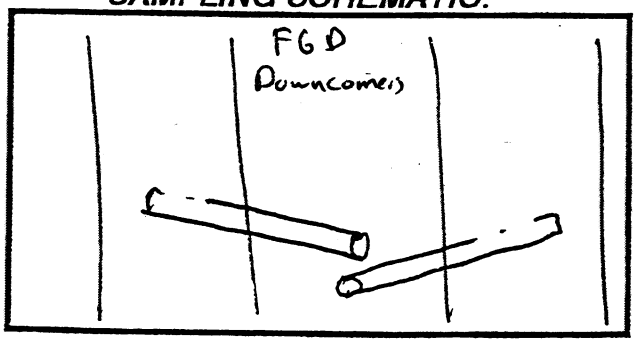
SAMPLING NOTES:

Slurry filtered on site

Filtrate retained and preserved with HNO_3

Solids dried @ 100°F for 3 hrs.

SAMPLING SCHEMATIC:



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Unit 4
Test 2
L-4

PROCESS STREAM SAMPLING SHEET

Sample Stream: Scrubber Over-Spray

Plant Boswell Unit 4

Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	8:50	9:20	9:55	10:30	11:05	11:35		
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW								
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler								
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 - Test 2
Sample Stream: Scrubber Over-Spray
Sample ID: L-4-2
Target Size: 3L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3
Container: HDPE Bottle
Frequency: 1/30 minutes
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:

Tap Sample on 6th Floor

O:\appres\stack\process

Unit 4
Test 3
S-3

PROCESS STREAM SAMPLING SHEET

COAL

Plant Bowell Unit 4 Sample Stream: Coal S-3

Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	1:35	2:10	2:45	3:40	4:10	4:40		
~~Weigth~~ / Volume	7- Scoops							
Comp / ~~Grab~~	Comp							
Process Status MW	540	540	541	539	540	539		
Sampler Condition	Clean							
Container Condition	New							
Container Label	Yes							
Sampler								
Sample Stored								
pH (if required)								
Temperature								
Preservative								
mill	G	F	D	C	B	A		
Coal	P	P	D	D	N	N		

Test ID: Unit 4 Test 3
Sample Stream: Coal
Sample ID: S-3-3
Target Size: 5 gallons
Sample Device: Slotted Scoop
Analysis:
Preservative:
Container: Bag & Bucket
Frequency: 1/30 minutes
Safety Issues:
Protective Gear: Gloves

Composite Logged? Yes
Sample Stored? Yes
Storage Method: 5 gal HDPE
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

Location	Start	Stop
Pt 1	1:25	1:55
2	2:25	2:55
3	3:30	4:00
4	4:26	4:56

SAMPLING SCHEMATIC:

P	P	P	D	D	N	N	
☐	☐	☒	☐	☐	☐	☐	CR
G	F	E	D	C	B	A	

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Unit 4
Test 3
S-7

PROCESS STREAM SAMPLING SHEET

ESP ASH

Sample Stream: ESP Ash S-7

Plant Boswell Unit 4

Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	1:45	start		off	4:54			
Weigth / ~~Volume~~								
~~Comp~~ / Grab	Grab							
Process Status								
Sampler Condition								
Container Condition								
Container Label								
Sampler								
Sample Stored								
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 3
Sample Stream: ESP Ash
Sample ID: S-7-3
Target Size:
Sample Device:
Analysis:
Preservative:
Container:
Frequency: 1 Grab @ completion of Test
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: Glass Bottle
Checked By: MSD
Shipped By: OCB
Received By: MSD

SAMPLING NOTES:

SAMPLING SCHEMATIC:

O:\appres\stack\process

Unit 4
Test 3
S-6 & L-3

PROCESS STREAM SAMPLING SHEET

Plant Bowell Unit 4 Sample Stream: FGD Slurry **Slurry** Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	1:40	2:15	2:50	3:45	4:15	4:45		
~~Weigth~~ / Volume	500mL							
Comp / ~~Grab~~	Comp							
Process Status MW								
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler								
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 3
Sample Stream: FGD Slurry
Sample ID: S-6 & L-3
Target Size: 3-4 L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3 for filtrate
Container: HDPE Bottle
Frequency: 1/30 min
Safety Issues:
Protective Gear: Glasses

Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle/Glass
Checked By: MSD
Shipped By: OCB
Received By: MSD

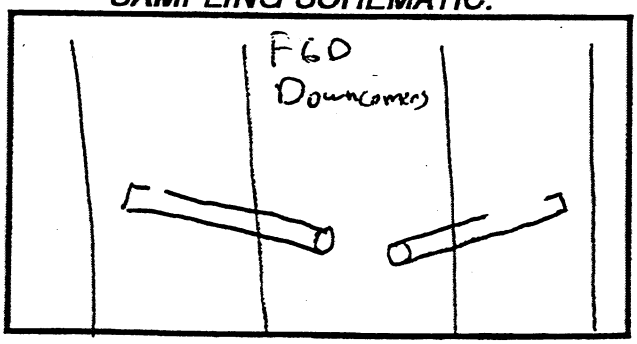
SAMPLING NOTES:

Slurry Filtered on Site

Filtrate retained & preserved with HNO_3

Solids dried @ 100°F for 3 hrs.

SAMPLING SCHEMATIC:



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Unit 4
Test 3
L-4
WATER

PROCESS STREAM SAMPLING SHEET

Plant Boswell Unit 4 Sample Stream: Scrubber Over-Spray Date 3/28/00

Increment	1	2	3	4	5	6	7	8
Time	1:50	2:20	2:55	3:50	4:20	4:50		
~~Weigth~~ / Volume	500ml		–					
Comp / ~~Grab~~	Comp							
Process Status MW								
Sampler Condition	Clean							
Container Condition	Clean							
Container Label	Yes							
Sampler								
Sample Stored	Yes							
pH (if required)								
Temperature								
Preservative								

Test ID: Unit 4 Test 3
Sample Stream: Scrubber Over-Spray
Sample ID: L-4-3
Target Size: 3L
Sample Device: HDPE Bottle
Analysis:
Preservative: HNO_3
Container: HDPE Bottle
Frequency: 1/30 minutes
Safety Issues:
Protective Gear:

Composite Logged? Yes
Sample Stored? Yes
Storage Method: HDPE Bottle
Checked By: MSP
Shipped By: OCB
Received By: MSP

SAMPLING NOTES:

SAMPLING SCHEMATIC:

Tap Sample on 6th Floor

O:\appres\stack\process

APPENDIX D
LABORATORY ANALYTICAL REPORTS

ONTARIO HYDRO SAMPLES ANALYTICAL REPORT

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg	Thim #		Sample Check-off
	MPBW - U2 - IN - 1 - OHM - 20MAR2000 - FHHNO3	3/23/00	OHM	✓			
	MPBW - U2 - IN - 1 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	10		
	MPBW - U2 - IN - 1 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - IN - 1 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - IN - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U2 - IN - 2 - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - IN - 2 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	12		
	MPBW - U2 - IN - 2 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - IN - 2 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - IN - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U2 - IN - 3 - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - IN - 3 - OHM - 20MAR2000 - ~~FILT~~ THIM	3/24/00	OHM	✓	15		
	MPBW - U2 - IN - 3 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - IN - 3 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - IN - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	~~MPBW - U2 - IN - SB - OHM - 20MAR2000 - KCl~~		OHM				
	~~MPBW - U2 - IN - SB - OHM - 20MAR2000 - FILT~~		OHM				
	~~MPBW - U2 - IN - SB - OHM - 20MAR2000 - KMNO4~~		OHM				
	~~MPBW - U2 - IN - SB - OHM - 20MAR2000 - HNO3/H2O2~~		OHM				
	~~MPBW - U2 - IN - SB - OHM - 20MAR2000 - HNO3~~		OHM	✓			
	MPBW - U2 - IN - BT - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - IN - BT - OHM - 20MAR2000 - FILT		OHM	✓	13		
	MPBW - U2 - IN - BT - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - IN - BT - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - IN - BT - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW-U2-IN-1-OHM-~~OHM~~ PT HNO3	3/23/00	OHM	X			
	MPBW-U2-IN-2-OHM-PT HNO3	3/24/00	OHM	X			
	MPBW-U2-IN-OHM-PT HNO3	3/24/00	OHM	X			
	MPBW-U2-IN-BT-PT HNO3	3/24/00	OHM	X			

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg	Thim #		Sample Check-off
	MPBW - U2 - OUT - 1 - OHM - 20MAR2000 - FHHNO3	3/23/00	OHM	✓			
	MPBW - U2 - OUT - 1 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	9		
	MPBW - U2 - OUT - 1 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - OUT - 1 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - OUT - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U2 - OUT - 2 - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - OUT - 2 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	11		
	MPBW - U2 - OUT - 2 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - OUT - 2 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - OUT - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U2 - OUT - 3 - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - OUT - 3 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	14		
	MPBW - U2 - OUT - 3 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - OUT - 3 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - OUT - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	~~MPBW - U2 - OUT - SB - OHM - 20MAR2000 - KCl~~		OHM				
	~~MPBW - U2 - OUT - SB - OHM - 20MAR2000 - FILT~~		OHM				
	~~MPBW - U2 - OUT - SB - OHM - 20MAR2000 - KMNO4~~		OHM				
	~~MPBW - U2 - OUT - SB - OHM - 20MAR2000 - HNO3/H2O2~~		OHM				
	~~MPBW - U2 - OUT - SB - OHM - 20MAR2000 - HNO3~~		OHM	✓			
	MPBW - U2 - OUT - BT - OHM - 20MAR2000 - FHHNO3	3/24/00	OHM	✓			
	MPBW - U2 - OUT - BT - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	16		
	MPBW - U2 - OUT - BT - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U2 - OUT - BT - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U2 - OUT - BT - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW U2-OUT-1-OHM-PT HNO3	3/23/00	OHM	✓			
	MPBW U2-OUT-2-OHM-PT HNO3	3/24/00	OHM	✓			
	MPBW U2-OUT-3-OHM-PT HNO3	3/24/00	OHM	✓			

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg OHM	~~Filt~~ Thim No.		Sample Check-off
	MPBW - U3 - IN - 1 - OHM - 20MAR2000 - FHHNO3	~~3/21~~	OHM	X			✓
	MPBW - U3 - IN - 1 - OHM - 20MAR2000 - ~~FILT~~ THIM	3/21/00	OHM	X	1		✓
	MPBW - U3 - IN - 1 - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - IN - 1 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - IN - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW - U3 - IN - 2 - OHM - 20MAR2000 - FHHNO3	3/21/00	OHM	X			✓
	MPBW - U3 - IN - 2 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	X	2		✓
	MPBW - U3 - IN - 2 - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - IN - 2 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - IN - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW - U3 - IN - 3 - OHM - 20MAR2000 - FHHNO3	3/22/00	OHM	X			
	MPBW - U3 - IN - 3 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	X			
	MPBW - U3 - IN - 3 - OHM - 20MAR2000 - BHKCL		OHM	X	4		
	MPBW - U3 - IN - 3 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - IN - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW - U3 - IN - SB - OHM - 20MAR2000 - KCl		OHM	X			
	MPBW - U3 - IN - SB - OHM - 20MAR2000 - ~~FILT~~ THIM	3/21/00	OHM	X	5		✓
	~~MPBW - U3 - IN - SB - OHM - 20MAR2000 - KMNO4~~		~~OHM~~	~~X~~			
	~~MPBW - U3 - IN - SB - OHM - 20MAR2000 - HNO3/H2O2~~		~~OHM~~				
	MPBW - U3 - IN - SB - OHM - 20MAR2000 - HNO3	3/21/00	OHM	X			
	MPBW - U3 - IN - BT - OHM - 20MAR2000 - FHHNO3	3/21/00	OHM	X			
	MPBW - U3 - IN - BT - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	X	3		
	MPBW - U3 - IN - BT - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - IN - BT - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - IN - BT - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	~~MPBW-U3-IN-~~						
	MPBW-U3-IN-1-OHM-PTHN03	3/21/00	OHM	X			✓
	MPBW-U3-IN-2-OHM-PTHN03	3/21/00	OHM	X			✓
	MPBW-U3-IN-BT-OHM-PTHN03	3/21/00	OHM	X			✓

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

blank from collected during test run 2

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg	Filter No.		Sample Check-off
	MPBW - U3 - OUT - 1 - OHM - 20MAR2000 - FHHNO3	3/21/00	OHM	X			✓
	MPBW - U3 - OUT - 1 - OHM - 20MAR2000 - FILT		OHM	X	1		✓
	MPBW - U3 - OUT - 1 - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - OUT - 1 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - OUT - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW - U3 - OUT - 2 - OHM - 20MAR2000 - FHHNO3	3/21/00	OHM	X			
	MPBW - U3 - OUT - 2 - OHM - 20MAR2000 - FILT		OHM	X	2		
	MPBW - U3 - OUT - 2 - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - OUT - 2 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - OUT - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW - U3 - OUT - 3 - OHM - 20MAR2000 - FHHNO3	3/22/00	OHM	X			
	MPBW - U3 - OUT - 3 - OHM - 20MAR2000 - FILT		OHM	X	4		
	MPBW - U3 - OUT - 3 - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - OUT - 3 - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - OUT - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	~~MPBW - U3 - OUT - SB - OHM - 20MAR2000 - KCl~~		OHM				
	MPBW - U3 - OUT - SB - OHM - 20MAR2000 - FILT	3/21/00	OHM	X	6		✓
	~~MPBW - U3 - OUT - SB - OHM - 20MAR2000 - KMNO4~~		OHM				
	~~MPBW - U3 - OUT - SB - OHM - 20MAR2000 - HNO3/H2O2~~		OHM				
	~~MPBW - U3 - OUT - SB - OHM - 20MAR2000 - HNO3~~		OHM				
	MPBW - U3 - OUT - BT - OHM - 20MAR2000 - FHHNO3	3/22/00	OHM	X			
	MPBW - U3 - OUT - BT - OHM - 20MAR2000 - FILT	3/22/00	OHM	X	~~#6~~ 5		✓
	MPBW - U3 - OUT - BT - OHM - 20MAR2000 - BHKCL		OHM	X			
	MPBW - U3 - OUT - BT - OHM - 20MAR2000 - BHHNO3		OHM	X			
	MPBW - U3 - OUT - BT - OHM - 20MAR2000 - BHKMNO4		OHM	X			
	MPBW-U3-OUT-1-OHM- PF HNO3	3/21/00	OHM	X			✓
	MPBW-U3-OUT-2-OHM- PF-HNO3	3/21/00	OHM	X			✓
	MPBW-U3-OUT-3-OHM-PF-HNO3	3/22/00	OHM	X			✓

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Blank train collected during test run 3

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Hg OHM	Thim No.		Sample Check-off
	MPBW - U4 - IN - 1 - OHM - 20MAR2000 - FHHNO3	3/27/00	OHM	✓			
	MPBW - U4 - IN - 1 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	19		
	MPBW - U4 - IN - 1 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - IN - 1 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - IN - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U4 - IN - 2 - OHM - 20MAR2000 - FHHNO3	3/28/00	OHM	✓			
	MPBW - U4 - IN - 2 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	20		
	MPBW - U4 - IN - 2 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - IN - 2 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - IN - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U4 - IN - 3 - OHM - 20MAR2000 - FHHNO3	3/28/00	OHM	✓			
	MPBW - U4 - IN - 3 - OHM - 20MAR2000 - ~~FILT~~ THIM		OHM	✓	21		
	MPBW - U4 - IN - 3 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - IN - 3 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - IN - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U4 - IN - BT - OHM - 20MAR2000 - FHHNO3	3/29/00	OHM	✓			
	MPBW - U4 - IN - BT - OHM - 20MAR2000 - FILT		OHM	✓	18		
	MPBW - U4 - IN - BT - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - IN - BT - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - IN - BT - OHM - 20MAR2000 - BHKMNO4		OHM	✓			

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Client	DOE, MP BOSWELL		
Work Order Number	20009.011.006.1100	Phone Number	610-701-7201
Contact Person	Jeff ONeill	Turn Around Time	Standard

Lab ID	Field Sample ID	Sample Collection Date	Analysis	OHM	FHTI Filter No.		Sample Check-off
	MPBW - U4 - OUT - 1 - OHM - 20MAR2000 - FHHNO3	3/27/00	OHM	✓			
	MPBW - U4 - OUT - 1 - OHM - 20MAR2000 - FILT		OHM	✓	3		
	MPBW - U4 - OUT - 1 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - OUT - 1 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - OUT - 1 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U4 - OUT - 2 - OHM - 20MAR2000 - FHHNO3	3/28/00	OHM	✓			
	MPBW - U4 - OUT - 2 - OHM - 20MAR2000 - FILT		OHM	✓	21		
	MPBW - U4 - OUT - 2 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - OUT - 2 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - OUT - 2 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	MPBW - U4 - OUT - 3 - OHM - 20MAR2000 - FHHNO3	3/28/00	OHM	✓			
	MPBW - U4 - OUT - 3 - OHM - 20MAR2000 - FILT		OHM	✓	16		
	MPBW - U4 - OUT - 3 - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - OUT - 3 - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - OUT - 3 - OHM - 20MAR2000 - BHKMNO4		OHM	✓			
	~~MPBW - U4 - OUT - SB - OHM - 20MAR2000 - KCl~~		OHM	✓			
	~~MPBW - U4 - OUT - SB - OHM - 20MAR2000 - FILT~~		OHM	✓			
	~~MPBW - U4 - OUT - SB - OHM - 20MAR2000 - KMNO4~~		OHM	✓			
	~~MPBW - U4 - OUT - SB - OHM - 20MAR2000 - HNO3/H2O2~~		OHM	✓			
	~~MPBW - U4 - OUT - SB - OHM - 20MAR2000 - HNO3~~		OHM	✓			
	MPBW - U4 - OUT - BT - OHM - 20MAR2000 - FHHNO3	3/27/00	OHM	✓			
	MPBW - U4 - OUT - BT - OHM - 20MAR2000 - FILT		OHM	✓	8		
	MPBW - U4 - OUT - BT - OHM - 20MAR2000 - BHKCL		OHM	✓			
	MPBW - U4 - OUT - BT - OHM - 20MAR2000 - BHHNO3		OHM	✓			
	MPBW - U4 - OUT - BT - OHM - 20MAR2000 - BHKMNO4		OHM	✓			

Notes: OHM - Speciated Mercury Analysis per Ontario Hydro Method

Relinquished By	Received By	Date	Time	Lab Use Only	
				Shipper	Air Bill #
				Opened By	Date/Time
				Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

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MERCURY ANALYSIS

BOSWELL ENERGY CENTER
UNIT 2

SAMPLE ID	SAMPLE TYPE	TOTAL ug			STANDARD DEVIATION
MPBW-U2-IN-1-FHHNO3	0.1 N HNO3	0.01	0.01		0.004
MPBW-U2-IN-1-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-1-BHKCL	KCL	3.05	3.00		0.219
MPBW-U2-IN-1-BHHNO3	H2O2/HNO3	0.01	0.03		0.057
MPBW-U2-IN-1-BHKMNO4	KMn04/H2SO4	2.67	2.61		0.085
MPBW-U2-OUT-1-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-1-PFHNO3	0.1 N HNO3	0.01	0.01	0.01	0.013
MPBW-U2-OUT-1-BHKCL	KCL	1.79	1.78		0.014
MPBW-U2-OUT-1-BHKCL#2	KCL	0.26	0.25		0.021
MPBW-U2-OUT-1-BHHNO3	H2O2/HNO3	0.03	0.01		0.064
MPBW-U2-OUT-1-BHKMNO4	KMn04/H2SO4	0.20	0.20	0.21	0.009
MPBW-U2-IN-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-2-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-2-BHKCL	KCL	2.19	2.15	2.19	0.046
MPBW-U2-IN-2-BHKCL#2	KCL	0.01	0.01		0.014
MPBW-U2-IN-2-BHHNO3	H2O2/HNO3	0.02	0.01	0.01	0.032
MPBW-U2-IN-2-BHKMNO4	KMn04/H2SO4	2.34	2.63	2.65	0.347
MPBW-U2-OUT-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-2-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-2-BHKCL	KCL	0.52	0.51		0.014
MPBW-U2-OUT-2-BHKCL#2	KCL	0.02	0.02		0.021
MPBW-U2-OUT-2-BHHNO3	H2O2/HNO3	0.01	0.01		0.007
MPBW-U2-OUT-2-BHKMNO4	KMn04/H2SO4	0.34	0.36		0.021
MPBW-U2-IN-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-BT-BHKCL	KCL	BDL	BDL		NA
MPBW-U2-IN-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U2-IN-BT-BHKMNO4	KMn04/H2SO4	BDL	BDL		NA
MPBW-U2-IN-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-3-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-IN-3-BHKCL	KCL	1.94	1.93		0.007
MPBW-U2-IN-3-BHKCL#2	KCL	0.03	0.04		0.014
MPBW-U2-IN-3-BHHNO3	H2O2/HNO3	0.06	0.07		0.028
MPBW-U2-IN-3-BHKMNO4	KMn04/H2SO4	4.25	4.20	4.17	0.085
MPBW-U2-OUT-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-3-PFHNO3	0.1 N HNO3	0.01	0.01	0.01	0.004
MPBW-U2-OUT-3-BHKCL	KCL	0.86	0.86	0.86	0
MPBW-U2-OUT-3-BHKCL#2	KCL	0.02	0.03		0.021
MPBW-U2-OUT-3-BHHNO3	H2O2/HNO3	0.02	BDL		NA
MPBW-U2-OUT-3-BHKMNO4	KMn04/H2SO4	0.16	0.19		0.035
MPBW-U2-OUT-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U2-OUT-BT-BHKCL	KCL	BDL	BDL		NA
MPBW-U2-OUT-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U2-OUT-BT-BHKMNO4	KMn04/H2SO4	BDL	BDL		NA

MERCURY ANALYSIS

BOSWELL ENERGY CENTER
UNIT 3

SAMPLE ID	SAMPLE TYPE	TOTAL ug			STANDARD DEVIATION
MPBW-SB	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-1-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-1-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-1-BHKCL	KCL	0.35	0.36	0.35	0.006
MPBW-U3-IN-1-BHHNO3	H2O2/HNO3	0.21	0.21	0.19	0.061
MPBW-U3-IN-1-BHKMNO4	KMn04/H2SO4	8.40	8.35	8.45	0.1
MPBW-U3-OUT-1-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-1-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-1-BHKCL	KCL	0.08	0.09	0.09	0.006
MPBW-U3-OUT-1-BHKCL#2	KCL	BDL	BDL		NA
MPBW-U3-OUT-1-BHHNO3	H2O2/HNO3	0.13	0.14		0.028
MPBW-U3-OUT-1-BHKMNO4	KMn04/H2SO4	10.45	10.95	10.90	0.551
MPBW-U3-IN-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-2-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-2-BHKCL	KCL	0.46	0.46		0
MPBW-U3-IN-2-BHHNO3	H2O2/HNO3	0.18	0.17	0.16	0.056
MPBW-U3-IN-2-BHKMNO4	KMn04/H2SO4	8.45	8.60		0.212
MPBW-U3-OUT-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-2-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-2-BHKCL	KCL	0.10	0.10	0.08	0.017
MPBW-U3-OUT-2-BHKCL#2	KCL	0.02	0.02		0.007
MPBW-U3-OUT-2-BHHNO3	H2O2/HNO3	0.14	0.14		0.007
MPBW-U3-OUT-2-BHKMNO4	KMn04/H2SO4	9.05	10.20		1.626
MPBW-U3-IN-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-BT-BHKCL	KCL	BDL	BDL		NA
MPBW-U3-IN-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U3-IN-BT-BHKMNO4	KMn04/H2SO4	BDL	BDL		NA
MPBW-U3-IN-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-3-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-IN-3-BHKCL	KCL	0.87	0.87	0.87	0.006
MPBW-U3-IN-3-BHKCL#2	KCL	0.03	0.03		0.007
MPBW-U3-IN-3-BHHNO3	H2O2/HNO3	0.11	0.09		0.071
MPBW-U3-IN-3-BHKMNO4	KMn04/H2SO4	7.65	7.45	7.25	0.4
MPBW-U3-OUT-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-3-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-3-BHKCL	KCL	0.09	0.09		0.007
MPBW-U3-OUT-3-BHKCL#2	KCL	0.01	0.02		0.014
MPBW-U3-OUT-3-BHHNO3	H2O2/HNO3	0.11	0.12		0.042
MPBW-U3-OUT-3-BHKMNO4	KMn04/H2SO4	9.55	9.65		0.141
MPBW-U3-OUT-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U3-OUT-BT-BHKCL	KCL	0.02	0.03		0.014
MPBW-U3-OUT-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U3-OUT-BT-BHKMNO4	KMn04/H2SO4	0.01	0.02		0.007

MERCURY ANALYSIS

BOSWELL ENERGY CENTER
UNIT 4

SAMPLE ID	SAMPLE TYPE	TOTAL ug			STANDARD DEVIATION
MPBW-U4-IN-1-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-1-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-1-BHKCL	KCL	0.52	0.53		0.014
MPBW-U4-IN-1-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U4-IN-1-BHKMNO4	KMn04/H2SO4	8.05	8.05	8.05	0
MPBW-U4-OUT-1-FHHNO3	0.1 N HNO3	0.04	0.04		0
MPBW-U4-OUT-1-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-1-BHKCL	KCL	0.22	0.23		0.012
MPBW-U4-OUT-1-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U4-OUT-1-BHKMNO4	KMn04/H2SO4	11.40	11.65		0.354
MPBW-U4-OUT-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-BT-BHKCL	KCL	0.07	0.06		0.021
MPBW-U4-OUT-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U4-OUT-BT-BHKMNO4	KMn04/H2SO4	BDL	BDL		NA
MPBW-U4-IN-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-2-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-2-BHKCL	KCL	1.71	1.70	1.71	0.042
MPBW-U4-IN-2-BHHNO3	H2O2/HNO3	0.08	0.08	0.06	0.042
MPBW-U4-IN-2-BHKMNO4	KMn04/H2SO4	2.30	2.25		0.071
MPBW-U4-OUT-2-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-2-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-2-BHKCL	KCL	0.78	0.78		0
MPBW-U4-OUT-2-BHHNO3	H2O2/HNO3	0.07	0.07		0.007
MPBW-U4-OUT-2-BHKMNO4	KMn04/H2SO4	10.25	10.35	10.35	0.115
MPBW-U4-IN-BT-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-BT-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-BT-BHKCL	KCL	0.05	0.05		0.007
MPBW-U4-IN-BT-BHHNO3	H2O2/HNO3	BDL	BDL		NA
MPBW-U4-IN-BT-BHKMNO4	KMn04/H2SO4	BDL	BDL		NA
MPBW-U4-IN-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-3-PTHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-IN-3-BHKCL	KCL	0.91	0.90	0.90	0.015
MPBW-U4-IN-3-BHHNO3	H2O2/HNO3	0.02	0.04		0.049
MPBW-U4-IN-3-BHKMNO4	KMn04/H2SO4	1.90	1.89		0.014
MPBW-U4-OUT-3-FHHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-3-PFHNO3	0.1 N HNO3	BDL	BDL		NA
MPBW-U4-OUT-3-BHKCL	KCL	0.95	0.98	0.99	0.042
MPBW-U4-OUT-3-BHHNO3	H2O2/HNO3	0.04	0.04		0.007
MPBW-U4-OUT-3-BHKMNO4	KMn04/H2SO4	9.20	9.30	9.25	0.1

Table 1. Mercury Concentration on Sample Filters/Thimbles

		Inlet		Outlet			
Unit No	Sample No.	Hg, µg/g	Particulate Wt., g	Hg,* µg	Hg,** µg/g	Particulate Wt., g	Part. Collection Efficiency, %
2	1	0.858	5.33696	0.12	3.39	0.03541	99.34
2	2	0.518	6.67777	0.0055	0.128	0.04285	99.36
2	3	0.253	5.55176	<0.002	<0.06	0.03162	99.43
3	1	0.005	4.12071	0.0040	0.0179	0.22396	94.57
3	2	<0.005	5.32011	<0.002	<0.009	0.22340	95.80
3	3	0.010	8.43634	0.0035	0.0200	0.17460	97.93
4	1	0.0485	3.33018	0.0090	0.101	0.08918	97.32
4	2	0743	6.43193	0.350	5.152	0.06794	98.94
4	3	0.695	6.50933	0.466	6.344	0.07345	98.87

* measured total mercury on filter
** calculated value (total mercury on filter/particulate wt. on filter)

Table 2. Filter/Thimble Blanks

Unit	Sample	Sample Location	Mercury, µg
2	Blank Train	Inlet	<0.002
2	Blank Train	Outlet	<0.002
3	Blank Train	Inlet	<0.002
3	Blank Train	Outlet	<0.002
4	Blank Train	Inlet	<0.002
4	Blank Train	Outlet	<0.002
	Filter Blank		<0.002
	Filter Blank		<0.002

ONTARIO HYDRO SAMPLES QA/QC SUMMARY

QUALITY CONTROL SUMMARY -- BOSWELL ENERGY CENTER

QC SAMPLE SUMMARY(4.00)
AVERAGE= 3.987
STD DEV. = 4.00± 0.075

CHECK STANDARD SUMMARY(5.00)
AVERAGE= 4.918
STD DEV. = 5.00 ± 0.097

FIELD SPIKE SUMMARY
KCL FIELD SPIKES = 100± 3.93
H2O2 FIELD SPIKES = 100± 7.48
KMNO4 FIELD SPIKES = 100± 5.71

LAB SPIKE SUMMARY
KCL LAB SPIKES = 100± 6.11
H2O2 LAB SPIKES = 100± 8.48
KMNO4 LAB SPIKES = 100± 7.34

PROCESS SOLID AND LIQUID SAMPLES ANALYTICAL REPORT

CONSOL INC.
RESEARCH & DEVELOPMENT
ANALYTICAL LABORATORY
4000 BROWNSVILLE ROAD, LIBRARY, PA 15129

DESCRIPTION *BOSWELL UNIT #2 COAL SAMPLES (S-1)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000943

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	7.31
Volatile Matter	42.81
Fixed Carbon	49.88
Sulfur, Total	0.62
BTU/lb	12158
MAF BTU/lb	13117
TOTAL MOISTURE %	26.60

ULTIMATE	(Dry)%
Carbon	70.79
Hydrogen	4.62
Nitrogen	0.99
Chlorine	<0.01
Sulfur, Total	0.62
Ash	7.31
Oxygen (DIFF)	15.67

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	35.42
Al2O3	16.93
TiO2	0.89
Fe2O3	5.70
CaO	15.41
MgO	4.08
Na2O	3.18
K2O	0.56
P2O5	0.22
SO3	16.49
UND	1.12

MISC. (As Det.) Dry Basis

MERCURY 0.064 ppm 0.078

F. factors = 9739 O_2-based
1869 CO_2-based

AS DETERMINED MOISTURE: 17.67 %

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4000 BROWNSVILLE ROAD, LIBRARY, PA 15129

DESCRIPTION *BOSWELL UNIT #2 COAL SAMPLES (S-1)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000944

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	7.97
Volatile Matter	43.14
Fixed Carbon	48.89
Sulfur, Total	0.62
BTU/lb	12087
MAF BTU/lb	13134

ULTIMATE	(Dry)%
Carbon	70.12
Hydrogen	4.60
Nitrogen	0.94
Chlorine	<0.01
Sulfur, Total	0.62
Ash	7.97
Oxygen (DIFF)	15.75

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	36.96
Al2O3	17.01
TiO2	0.92
Fe2O3	5.46
CaO	16.51
MgO	3.98
Na2O	2.51
K2O	0.56
P2O5	0.24
SO3	15.02
UND	0.83

TOTAL MOISTURE % 26.50

MISC. (As Det.) Dry Basis

MERCURY 0.036 ppm 0.043

F-factors = 9702 O_2-based
1869 CO_2-based

AS DETERMINED MOISTURE: 16.45 %

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DESCRIPTION *BOSWELL UNIT #2 COAL SAMPLES (S-1)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000945

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	8.12
Volatile Matter	43.09
Fixed Carbon	48.79
Sulfur, Total	0.68
BTU/lb	12100
MAF BTU/lb	13169

ULTIMATE	(Dry)%
Carbon	70.34
Hydrogen	4.60
Nitrogen	1.04
Chlorine	<0.01
Sulfur, Total	0.68
Ash	8.12
Oxygen (DIFF)	15.22

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	37.85
Al2O3	17.34
TiO2	0.93
Fe2O3	6.22
CaO	15.35
MgO	3.89
Na2O	2.35
K2O	0.62
P2O5	0.25
SO3	14.91
UND	0.29

TOTAL MOISTURE % 26.40

MISC. (As Det.) Dry Basis

MERCURY 0.041 ppm 0.049

F. Factors = 9743 O_2-based
1866 CO_2-based

AS DETERMINED MOISTURE: 16.11 %

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DESCRIPTION *BOSWELL UNIT #3 COAL SAMPLES (S-2)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000946

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	7.67
Volatile Matter	42.64
Fixed Carbon	49.69
Sulfur, Total	0.61
BTU/lb	12072
MAF BTU/lb	13075

TOTAL MOISTURE % 26.10

MISC. (As Det.)

MERCURY 0.046 ppm

ULTIMATE	(Dry)%
Carbon	70.50
Hydrogen	4.54
Nitrogen	0.99
Chlorine	<0.01
Sulfur, Total	0.61
Ash	7.67
Oxygen (DIFF)	15.69

Dry Basis

0.054

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	37.56
Al2O3	17.88
TiO2	0.92
Fe2O3	5.03
CaO	15.17
MgO	4.15
Na2O	1.92
K2O	0.43
P2O5	0.30
SO3	15.83
UND	0.81

F. factors = 9746 O_2-based
1875 CO_2-based

AS DETERMINED MOISTURE: 15.40 %

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DESCRIPTION *BOSWELL UNIT #3 COAL SAMPLES (S-2)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000947

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	8.13
Volatile Matter	42.54
Fixed Carbon	49.33
Sulfur, Total	0.75
BTU/lb	12052
MAF BTU/lb	13119
TOTAL MOISTURE %	28.30

ULTIMATE	(Dry)%
Carbon	70.35
Hydrogen	4.50
Nitrogen	1.01
Chlorine	<0.01
Sulfur, Total	0.75
Ash	8.13
Oxygen (DIFF)	15.26

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	36.05
Al2O3	16.98
TiO2	0.91
Fe2O3	6.23
CaO	15.31
MgO	3.97
Na2O	1.80
K2O	0.34
P2O5	0.27
SO3	16.51
UND	1.63

MISC. (As Det.)

MERCURY 0.060 ppm

Dry Basis
0.072

F-factors = 9755 O_2-based
1874 CO_2-based

AS DETERMINED MOISTURE: 16.87 %

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DESCRIPTION *BOSWELL UNIT #3 COAL SAMPLES (S-2)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000948

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	8.54
Volatile Matter	42.07
Fixed Carbon	49.39
Sulfur, Total	0.68
BTU/lb	11972
MAF BTU/lb	13090

ULTIMATE	(Dry)%
Carbon	69.96
Hydrogen	4.39
Nitrogen	0.99
Chlorine	<0.01
Sulfur, Total	0.68
Ash	8.54
Oxygen (DIFF)	15.44

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	38.89
Al2O3	17.43
TiO2	0.89
Fe2O3	4.82
CaO	14.65
MgO	4.08
Na2O	1.94
K2O	0.32
P2O5	0.25
SO3	15.68
UND	1.05

TOTAL MOISTURE % 27.80

MISC. (As Det.) Dry Basis

MERCURY 0.051 ppm 0.063

F- factors = 9726 O_2- based
1876 CO_2- based

AS DETERMINED MOISTURE: 18.44 %

DISTRIBUTION:
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DESCRIPTION *BOSWELL UNIT #4 COAL SAMPLES (S-3)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000949

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	7.27
Volatile Matter	42.93
Fixed Carbon	49.80
Sulfur, Total	0.54
BTU/lb	12075
MAF BTU/lb	13022

ULTIMATE	(Dry)%
Carbon	70.89
Hydrogen	4.52
Nitrogen	0.94
Chlorine	<0.01
Sulfur, Total	0.54
Ash	7.27
Oxygen (DIFF)	15.84

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	37.66
Al2O3	18.51
TiO2	0.93
Fe2O3	4.30
CaO	14.69
MgO	4.34
Na2O	2.26
K2O	0.47
P2O5	0.34
SO3	15.31
UND	1.19

TOTAL MOISTURE % 26.70

MISC. (As Det.) Dry Basis

MERCURY 0.055 ppm 0.065

F-factors = 9778 O_2-based
1885 CO_2-based

AS DETERMINED MOISTURE: 15.32 %

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DESCRIPTION *BOSWELL UNIT #4 COAL SAMPLES (S-3)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000950

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	7.44
Volatile Matter	42.84
Fixed Carbon	49.72
Sulfur, Total	0.57
BTU/lb	12197
MAF BTU/lb	13177

ULTIMATE	(Dry)%
Carbon	70.96
Hydrogen	4.56
Nitrogen	0.99
Chlorine	<0.01
Sulfur, Total	0.57
Ash	7.44
Oxygen (DIFF)	15.48

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	40.23
Al2O3	17.96
TiO2	0.93
Fe2O3	4.60
CaO	13.58
MgO	3.75
Na2O	2.30
K2O	0.75
P2O5	0.34
SO3	14.92
UND	0.64

TOTAL MOISTURE % 26.30

MISC. (As Det.) Dry Basis

MERCURY 0.053 ppm 0.063

F-factor = 9716 O_2-based
1868 CO_2-based

AS DETERMINED MOISTURE: 16.19 %

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DESCRIPTION *BOSWELL UNIT #4 COAL SAMPLES (S-3)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *04/17/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000951

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	8.62
Volatile Matter	42.85
Fixed Carbon	48.53
Sulfur, Total	0.60
BTU/lb	11888
MAF BTU/lb	13009
TOTAL MOISTURE %	25.00

ULTIMATE	(Dry)%
Carbon	69.43
Hydrogen	4.38
Nitrogen	1.00
Chlorine	<0.01
Sulfur, Total	0.60
Ash	8.62
Oxygen (DIFF)	15.97

MAJOR ASH ELEM	%
Ignited at 750 C	
SiO2	42.57
Al2O3	17.80
TiO2	0.86
Fe2O3	4.27
CaO	12.76
MgO	3.64
Na2O	1.69
K2O	0.78
P2O5	0.31
SO3	14.26
UND	1.06

MISC. (As Det.) Dry Basis

MERCURY 0.059 ppm 0.070

F. factors = 9699 O_2-based
1875 CO_2-based

AS DETERMINED MOISTURE: 15.24 %

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DESCRIPTION *BOSWELL UNIT #2 BAGHOUSE FLYASH (S-4)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000952

ANALYSIS REPORT

PROXIMATE	(Dry)%	ULTIMATE	(Dry)%	MAJOR ASH ELEM	(Dry)%
Ash	98.41	Carbon	1.31	SiO2	42.78
Total Sulfur	0.88	Ash	98.41	Al2O3	20.29
				TiO2	1.00
MISC. (As Det.)	Dry Basis			Fe2O3	5.93
				CaO	17.06
MERCURY	0.966 PPM	0.967 ppm		MgO	4.41
				Na2O	3.03
				K2O	0.67
				P2O5	0.33
				SO3	2.19
				UND	2.31

AS DETERMINED MOISTURE: 0.10 %

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DESCRIPTION *BOSWELL UNIT #2 BAGHOUSE FLYASH (S-4)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000953

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	98.63
Total Sulfur	0.87

ULTIMATE	(Dry)%
Carbon	1.08
Ash	98.63

MAJOR ASH ELEM	(Dry)%
SiO2	41.86
Al2O3	20.57
TiO2	0.98
Fe2O3	5.37
CaO	18.20
MgO	4.58
Na2O	2.96
K2O	0.71
P2O5	0.34
SO3	2.17
UND	2.26

MISC. (As Det.)

MERCURY 0.928 PPM
Dry Basis
0.928 ppm

AS DETERMINED MOISTURE: 0.06 %

DISTRIBUTION:
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DESCRIPTION *BOSWELL UNIT #2 BAGHOUSE FLYASH (S-4)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000954

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	99.05
Total Sulfur	0.80

ULTIMATE	(Dry)%
Carbon	0.70
Ash	99.05

MAJOR ASH ELEM	(Dry)%
SiO2	40.99
Al2O3	20.96
TiO2	1.00
Fe2O3	5.08
CaO	18.78
MgO	4.74
Na2O	3.03
K2O	0.70
P2O5	0.33
SO3	1.99
UND	2.40

MISC. (As Det.)

MERCURY 0.893 PPM

Dry Basis
0.893 ppm

AS DETERMINED MOISTURE: 0.07 %

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DESCRIPTION *BOSWELL UNIT #3 SCRUBBER SOLIDS (S-5)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER **000955**

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	98.50
Total Sulfur	0.96

ULTIMATE	(Dry)%
Carbon	0.24
Ash	98.50

MAJOR ASH ELEM	(Dry)%
SiO2	42.79
Al2O3	22.64
TiO2	1.19
Fe2O3	4.72
CaO	16.05
MgO	4.23
Na2O	2.54
K2O	0.54
P2O5	0.38
SO3	2.39
UND	2.53

MISC. (As Det.)

MERCURY 0.075 PPM

Dry Basis

0.076 ppm

AS DETERMINED MOISTURE: 1.70 %

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DESCRIPTION *BOSWELL UNIT #3 SCRUBBER SOLIDS (S-5)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000956

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	98.16
Total Sulfur	0.60

ULTIMATE	(Dry)%
Carbon	0.25
Ash	98.16

MAJOR ASH ELEM	(Dry)%
SiO2	43.89
Al2O3	22.38
TiO2	1.18
Fe2O3	4.83
CaO	15.66
MgO	4.37
Na2O	2.49
K2O	0.58
P2O5	0.38
SO3	1.49
UND	2.75

MISC. (As Det.)

MERCURY 0.041 PPM

Dry Basis

0.042 ppm

AS DETERMINED MOISTURE: 1.68 %

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DESCRIPTION *BOSWELL UNIT #3 SCRUBBER SOLIDS (S-5)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000957

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	98.17
Total Sulfur	0.51

ULTIMATE	(Dry)%
Carbon	0.23
Ash	98.17

MAJOR ASH ELEM	(Dry)%
SiO2	45.40
Al2O3	22.15
TiO2	1.07
Fe2O3	4.52
CaO	15.14
MgO	4.22
Na2O	2.27
K2O	0.54
P2O5	0.34
SO3	1.28
UND	3.07

MISC. (As Det.)

MERCURY 0.035 PPM

Dry Basis

0.036 ppm

AS DETERMINED MOISTURE: 2.27 %

DISTRIBUTION:
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TO: M. DEVITO

PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 OVERSPRAY LIQUID (L-1)
SAMPLE NUMBER TEST #1
ANALYTICAL NUMBER 000964

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.64		
Aluminum		16.4		
Calcium		655		
Total Iron		1.15		
Magnesium		131		
Manganese		1.50		
Potassium		6.27		
Sodium		24.9		
Si		52.6		
Ti		0.38		
P		0.14		
S		736		
MERCURY	ppb	0.90		

Note: All units mg/L unless specified

MSD

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LIBRARY, PENNSYLVANIA 15129

TO: M. DEVITO

PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 OVERSPRAY LIQUID (L-1)
SAMPLE NUMBER TEST #2
ANALYTICAL NUMBER 000965

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.56		
Aluminum		18.9		
Calcium		701		
Total Iron		1.35		
Magnesium		139		
Manganese		1.59		
Potassium		6.66		
Sodium		25.9		
Si		56.5		
Ti		0.43		
P		0.20		
S		779		
MERCURY	ppb	1.1		

Note: All units mg/L unless specified

MSD

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LIBRARY, PENNSYLVANIA 15129

TO: M. DEVITO

PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 OVERSPRAY LIQUID (L-1)
SAMPLE NUMBER TEST #3
ANALYTICAL NUMBER 000966

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.57		
Aluminum		22.2		
Calcium		697		
Total Iron		1.52		
Magnesium		136		
Manganese		1.73		
Potassium		6.31		
Sodium		25.0		
Si		56.6		
Ti		0.56		
P		0.22		
S		757		
MERCURY	ppb	0.78		

Note: All units mg/L unless specified

MSD

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ANALYTICAL LABORATORY
LIBRARY, PENNSYLVANIA 15129

TO: M. DEVITO

PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 SCRUBBER LIQUID DISCHARGE (L-2)
SAMPLE NUMBER TEST #1
ANALYTICAL NUMBER 000967

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.63		
Aluminum		20.3		
Calcium		769		
Total Iron		1.03		
Magnesium		139		
Manganese		1.74		
Potassium		6.43		
Sodium		24.6		
Si		59.3		
Ti		0.27		
P		0.14		
S		824		
MERCURY	ppb	1.1		

Note: All units mg/L unless specified

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TO: M. DEVITO

PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 SCRUBBER LIQUID DISCHARGE (L-2)
SAMPLE NUMBER TEST #2
ANALYTICAL NUMBER 000968

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.64		
Aluminum		16.0		
Calcium		774		
Total Iron		0.67		
Magnesium		132		
Manganese		1.68		
Potassium		5.58		
Sodium		21.3		
Si		56.6		
Ti		0.21		
P		0.14		
S		799		
MERCURY	ppb	0.85		

Note: All units mg/L unless specified

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PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #3 SCRUBBER LIQUID DISCHARGE (L-2)
SAMPLE NUMBER TEST #3
ANALYTICAL NUMBER 000969

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.70		
Aluminum		14.1		
Calcium		726		
Total Iron		0.63		
Magnesium		128		
Manganese		1.75		
Potassium		5.57		
Sodium		21.6		
Si		52.5		
Ti		0.21		
P		0.10		
S		757		
MERCURY	ppb	0.79		

Note: All units mg/L unless specified

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DESCRIPTION *BOSWELL UNIT #4 FGD SOLIDS (S-6)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000958

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	93.74
Total Sulfur	8.56

ULTIMATE	(Dry)%
Carbon	0.03
Ash	93.74

MAJOR ASH ELEM	(Dry)%
SiO2	31.17
Al2O3	16.09
TiO2	0.76
Fe2O3	2.74
CaO	14.89
MgO	2.27
Na2O	1.69
K2O	0.49
P2O5	0.25
SO3	21.41
UND	8.24

MISC. (As Det.)

MERCURY 0.018 PPM

Dry Basis

0.021 ppm

AS DETERMINED MOISTURE: 16.18 %

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DESCRIPTION *BOSWELL UNIT #4 FGD SOLIDS (S-6)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000959

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	94.41
Total Sulfur	7.41

ULTIMATE	(Dry)%
Carbon	0.03
Ash	94.41

MAJOR ASH ELEM	(Dry)%
SiO2	34.53
Al2O3	16.34
TiO2	0.83
Fe2O3	3.36
CaO	13.47
MgO	1.91
Na2O	1.69
K2O	0.56
P2O5	0.26
SO3	18.52
UND	8.53

MISC. (As Det.)

MERCURY 0.024 PPM

Dry Basis

0.027 ppm

AS DETERMINED MOISTURE: 9.27 %

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DESCRIPTION *BOSWELL UNIT #4 FGD SOLIDS (S-6)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000960

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	94.18
Total Sulfur	7.73

ULTIMATE	(Dry)%
Carbon	0.04
Ash	94.18

MAJOR ASH ELEM	(Dry)%
SiO2	33.94
Al2O3	15.96
TiO2	0.82
Fe2O3	3.08
CaO	14.07
MgO	1.84
Na2O	1.72
K2O	0.62
P2O5	0.25
SO3	19.32
UND	8.38

MISC. (As Det.)

MERCURY 0.028 PPM
LEAD

Dry Basis

0.031 ppm

AS DETERMINED MOISTURE: 9.46 %

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DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 SCRUBBER LIQUID DISCHARGE (L-4)
SAMPLE NUMBER TEST #1
ANALYTICAL NUMBER 000973

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.16		
Aluminum		225		
Calcium		416		
Total Iron		3.80		
Magnesium		10400		
Manganese		8.31		
Potassium		140		
Sodium		1200		
Si		93.2		
Ti		1.21		
P		2.17		
S		15280		
MERCURY	ppb	2.7		

Note: All units mg/L unless specified

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PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 SCRUBBER LIQUID DISCHARGE (L-4)
SAMPLE NUMBER TEST #2
ANALYTICAL NUMBER 000974

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		4.02		
Aluminum		259		
Calcium		412		
Total Iron		3.76		
Magnesium		10600		
Manganese		6.22		
Potassium		142		
Sodium		1200		
Si		116.7		
Ti		0.98		
P		2.21		
S		15857		
MERCURY	ppb	2.9		

Note: All units mg/L unless specified

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DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 SCRUBBER LIQUID DISCHARGE (L-4)
SAMPLE NUMBER TEST #3
ANALYTICAL NUMBER 000975

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		3.96		
Aluminum		293		
Calcium		436		
Total Iron		4.09		
Magnesium		10300		
Manganese		6.45		
Potassium		138		
Sodium		1160		
Si		127.5		
Ti		0.76		
P		2.05		
S		15447		
MERCURY	ppb	2.4		

Note: All units mg/L unless specified

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PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 OVERSPRAY LIQUID (L-3)
SAMPLE NUMBER TEST #1
ANALYTICAL NUMBER 000970

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		7.67		
Aluminum		<0.05		
Calcium		44.2		
Total Iron		1.98		
Magnesium		15.1		
Manganese		0.28		
Potassium		2.18		
Sodium		3.99		
Si		2.18		
Ti		0.06		
P		<0.05		
S		3.65		
MERCURY	ppb	0.78		

Note: All units mg/L unless specified

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PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 OVERSPRAY LIQUID (L-3)
SAMPLE NUMBER TEST #2
ANALYTICAL NUMBER 000971

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		7.83		
Aluminum		<0.05		
Calcium		43.1		
Total Iron		2.00		
Magnesium		14.6		
Manganese		0.28		
Potassium		2.09		
Sodium		3.86		
Si		2.13		
Ti		0.06		
P		<0.05		
S		3.34		
MERCURY	ppb	0.91		

Note: All units mg/L unless specified

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PROJECT NUMBER 1621-29 -6

DATE LOGGED 03/29/00
DATE COMPLETED 05/12/00

DESCRIPTION BOSWELL UNIT #4 OVERSPRAY LIQUID (L-3)
SAMPLE NUMBER TEST #3
ANALYTICAL NUMBER 000972

		-------- WATER ANALYSIS ---------		
ANALYSIS	UNITS	VALUE	VALUE	DUP AVG
pH		7.81		
Aluminum		<0.05		
Calcium		44.0		
Total Iron		1.92		
Magnesium		14.8		
Manganese		0.28		
Potassium		2.17		
Sodium		3.99		
Si		3.26		
Ti		0.06		
P		<0.05		
S		2.20		
MERCURY	ppb	0.61		

Note: All units mg/L unless specified

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DESCRIPTION *BOSWELL UNIT #4 ESP ASH (S-7)*

SAMPLE NUMBER TEST #1

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER **000961**

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	99.88
Total Sulfur	0.45

MISC. (As Det.)

MERCURY 0.010 PPM

Dry Basis
0.010 ppm

ULTIMATE	(Dry)%
Carbon	0.03
Ash	99.88

MAJOR ASH ELEM	(Dry)%
SiO2	42.89
Al2O3	21.30
TiO2	1.05
Fe2O3	5.14
CaO	18.01
MgO	4.71
Na2O	2.36
K2O	0.55
P2O5	0.35
SO3	1.13
UND	2.51

AS DETERMINED MOISTURE: 0.01 %

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DESCRIPTION *BOSWELL UNIT #4 ESP ASH (S-7)*

SAMPLE NUMBER TEST #2

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER 000962

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	99.92
Total Sulfur	0.40

ULTIMATE	(Dry)%
Carbon	0.04
Ash	99.92

MAJOR ASH ELEM	(Dry)%
SiO2	46.89
Al2O3	21.11
TiO2	1.04
Fe2O3	4.73
CaO	16.43
MgO	4.09
Na2O	2.23
K2O	0.93
P2O5	0.34
SO3	1.00
UND	1.21

MISC. (As Det.)

MERCURY 0.016 PPM

Dry Basis

0.016 ppm

AS DETERMINED MOISTURE: <0.01 %

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DESCRIPTION *BOSWELL UNIT #4 ESP ASH (S-7)*

SAMPLE NUMBER TEST #3

DATE LOGGED *03/29/00*
DATE COMPLETED *05/01/00*
PROJECT NUMBER *1621-29 -6*
ANALYTICAL NUMBER **000963**

ANALYSIS REPORT

PROXIMATE	(Dry)%
Ash	99.86
Total Sulfur	0.44

ULTIMATE	(Dry)%
Carbon	0.04
Ash	99.86

MAJOR ASH ELEM	(Dry)%
SiO2	47.59
Al2O3	21.14
TiO2	1.04
Fe2O3	4.42
CaO	15.83
MgO	4.00
Na2O	2.47
K2O	1.04
P2O5	0.34
SO3	1.10
UND	1.03

MISC. (As Det.)

MERCURY 0.012 PPM
LEAD

Dry Basis
0.012 ppm

AS DETERMINED MOISTURE: 0.01 %

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PROCESS SOLID AND LIQUID SAMPLES QA/QC SUMMARY

QA/QC Text for Process Stream Samples Analyzed by CONSOL Inc.

All process stream samples were analyzed by CONSOL following carefully written sampling and analytical procedures. These procedures are reviewed periodically to maintain consistency with industry standards and practices. Professional staff members take an active part in the development and testing of the ASTM methods used in this program. The individual determinations were completed by experiences staff personnel who were specifically trained in the individual analytical procedures. Analyst performance and data quality are monitored using quality control samples, certified standards, blind samples and duplicate samples. For this program, duplicate analysis was performed on every sample. The CONSOL R&D Laboratory participates in a variety of external auditing programs specific to coal analyses. Two of these programs specific to these samples are the EPRI-sponsored mercury-in-coal-analysis round robin study and the Standard Laboratories Inc., "Interlab" round robin program. A summary of the performance indicators used to access data quality for this program are discussed as follows.

Quality Control Check Samples

The CONSOL R&D lab utilized a number of quality control check samples (QCCS) for this program. Accuracy is determined from the percent difference in the measured value from the QCCS reference value. The specific samples and the results obtained from the analysis of these samples used to access the quality of the coal analysis are shown Table 1. Similar data for the ash samples are presented in Table 3.

Analytical Precision

All process stream samples were analyzed in duplicate. Analytical precision was determined by the percent difference in the duplicate sample analysis. The percent relative difference (PRD) obtained in for the sample analyses completed in this program are summarized in Table 2 (coal samples) and Table 4 (ash samples).

Summary of Analytical Performance

A summary of the QC checks and relative percent differences are as follows:

Parameter	Coal Samples		ESP Ash Samples	
	Accuracy	PRD	Accuracy	PRD
Ult./Prox.	98% - 102%	0% - 3%	—	—
Carbon	100%	0.3%	100%	NA
Ash	100%	0.5%	101%	0.1%
Sulfur	101%	2%	95%	2%
Btu	100%	0.2%	—	—
Ash Elements	97% - 102%	0.2% - 2%	97% - 105%	0.6% - 2%
Mercury	100%	11%	100%	4%
Chlorine	102%	0%	—	—

The analytical accuracy for all parameters for both the coal and ash samples were 100 ± 5%. This is well within the data quality objectives. The relative percent differences, as an indication of analytical precision for all parameters except mercury on the coal samples were ≤10%. The coal mercury analysis showed a PRD at 12%. This is a result of the extremely low mercury concentration in the coal samples which for this test ranged from 0.04 to 0.06 ppm. A precision of 12% is excellent for this low level.

Table 1. QCCS Summary for Coal Analysis
(units are % unless noted)

Parameter	QC Sample	QCCS Value	# of Checks	Avg Result	% Recovery
Moisture	Coal	1.30	2	1.29	99.2
Carbon	EDTA	41.10	2	41.06	99.9
Hydrogen	EDTA	5.52	2	5.42	98.1
Nitrogen	EDTA	9.59	2	9.66	100.7
Ash	Coal	6.00	2	5.99	99.8
Volatile Matter	Coal	38.05	2	38.30	100.6
Sulfur	NIST 2692A	1.17	3	1.19	101.3
Cl, ppm	NIST 1632c	0.114	1	0.116	101.7
Hg, ppm	BCR 181	0.138	3	0.143	103.9
Btu	Benzoic Acid	11373	2	11363	99.9
SiO_2	NIST 1633a	48.82	2	48.44	99.2
$Al2O_3$	NIST 1633a	27.03	2	26.32	97.4
TiO_2	NIST 1633a	1.34	2	1.36	101.5
Fe_2O_3	NIST 1633a	13.45	2	13.52	100.5
CaO	NIST 1633a	1.55	2	1.56	100.3
MgO	NIST 1633a	0.75	2	0.74	98.7
Na_2O	NIST 1633a	0.23	2	0.23	100.0
K_2O	NIST 1633a	2.27	2	2.25	99.1
P_2O_5	NIST 1633a	0.41	2	0.42	102.4
SO_3	NIST 1633a	0.37	2	0.30	81.1

Table 2. Precision Summary for Coal Analysis

Parameter	No. of Pairs	Average PRD
Moisture	9	0.2
Carbon	9	0.3
Hydrogen	9	1.1
Nitrogen	9	3.3
Ash	9	0.5
Volatile Matter	9	0.4
Sulfur	9	2.1
Cl, ppm	9	0.0
Hg, ppm	9	11.2
Btu	9	0.2
SiO_2	9	1.1
$Al2O_3$	9	0.9
TiO_2	9	1.6
Fe_2O_3	9	2.1
CaO	9	0.7
MgO	9	0.8
Na_2O	9	0.9
K_2O	9	1.9
P_2O_5	9	1.3
SO_3	9	0.9

Table 3. QCCS Summary for Ash Analysis
(units are % unless noted)

Parameter	QC Sample	QCCS Value	# of Checks	Avg Result	% Recovery
Moisture	Coal	1.30	2	1.26	96.9
Carbon	EDTA	41.10	2	41.15	100.1
Ash	Coal	6.00	2	6.08	101.3
Sulfur[1]					
Hg, ppm	BCR 181	0.138	2	0.139	100.0
SiO_2	NIST 1633a	48.82	2	49.44	100.5
$Al2O_3$	NIST 1633a	27.03	2	29.00	102.8
TiO_2	NIST 1633a	1.34	2	1.37	101.9
Fe_2O_3	NIST 1633a	13.45	2	13.45	100.0
CaO	NIST 1633a	1.55	2	1.50	96.5
MgO	NIST 1633a	0.75	2	0.77	102.7
Na_2O	NIST 1633a	0.23	2	0.24	104.3
K_2O	NIST 1633a	2.27	2	2.39	105.1
P_2O_5	NIST 1633a	0.42	2	0.43	102.4
SO_3	NIST 1633a	0.37	2	0.35	94.6

1- Sulfur was determined from the ICP-AES analysis conducted on the digested samples.

Table 4. Precision Summary for Ash Analysis

Parameter	No. of Pairs	Average PRD
Carbon	12	30.6
Ash	12	0.1
Sulfur	9	1.8
Hg, ppm	12 (7) [2]	20.7 (3.7) [2]
SiO_2	9	0.7
$Al2O_3$	9	0.6
TiO_2	9	1.9
Fe_2O_3	9	1.7
CaO	9	1.1
MgO	9	0.8
Na_2O	9	0.9
K_2O	9	1.9
P_2O_5	9	2.0
SO_3	9	2.4

2 - A total of 12 ash samples were analyzed for mercury. The RPD for all 12 samples was 20.7%. Of these 12 samples, 5 had very low levels of mercury which skewed the average RPD. When calculating the RPD on those samples that contained over 0.03 ppm of mercury, the average RPD was 3.7%.

Minnesota Power - Clay Boswell Station
QCCS Summary for Coal Analysis
Dry Basis - All Results Percent Unless Noted

Parameter	QC Sample	QCCS Value	R-1	R-2	R-3	Avg	% Rec	RPD
Volatile Matter	Coal	38.05	38.02	38.58		38.30	100.7%	1%
Ash	Coal	6.00	6.01	5.96		5.99	99.8%	1%
Carbon	EDTA	41.10	41.24	40.88		41.06	99.9%	1%
Hydrogen	EDTA	5.52	5.46	5.37		5.42	98.1%	2%
Nitrogen	EDTA	9.59	9.70	9.61		9.66	100.7%	1%
Sulfur	NIST 2692A	1.17	1.18	1.19		1.19	101.3%	1%
Chlorine	NIST 1632C	0.114	0.116			0.116	101.7%	NA
Mercury, ppm	BCR 181	138	139	161	130	143	103.9%	8%
Btu/lb	Benzoic Acid	11373	11353	11372		11363	99.9%	0%
Total Moisture	Coal	1.30	1.18	1.40		1.29	99.2%	17%
Average							100.5%	
Ash Elements								
SiO2	NIST 1633a	48.82	48.60	48.28		48.44	99.2%	1%
Al2O3	NIST 1633a	27.03	26.20	26.43		26.32	97.4%	1%
TiO2	NIST 1633a	1.34	1.36	1.36		1.36	101.5%	0%
Fe2O3	NIST 1633a	13.45	13.77	13.26		13.52	100.5%	4%
CaO	NIST 1633a	1.55	1.59	1.52		1.56	100.3%	5%
MgO	NIST 1633a	0.75	0.73	0.75		0.74	98.7%	3%
Na2O	NIST 1633a	0.23	0.23	0.23		0.23	100.0%	0%
K2O	NIST 1633a	2.27	2.25	2.25		2.25	99.1%	0%
P2O5	NIST 1633a	0.41	0.42	0.42		0.42	102.4%	0%
SO3	NIST 1633a	0.37	0.29	0.31		0.30	81.1%	7%
Average							98.0%	

Minnesota Power - Clay Boswell Station
QCCS Summary for Ash Analysis
Dry Basis - All Results Percent Unless Noted

Parameter	QC Sample	QCCS Value	R-1	R-2	R-3	Avg	% Rec	RPD
Ash	Coal	6.00	6.01	6.14		6.08	101.3%	2%
Carbon	EDTA	41.10	40.87	41.43		41.15	100.1%	1%
Mercury, ppm	BCR 181	146	131	161		146	100.0%	8%
Total Moisture	Coal	1.30	1.22	1.30		1.26	96.9%	6%
Average							99.6%	
Ash Elements								
SiO2	NIST 1633a	48.82	48.72	49.44		49.08	100.5%	1%
Al2O3	NIST 1633a	27.03	26.59	29.00		27.80	102.8%	9%
TiO2	NIST 1633a	1.34	1.34	1.39		1.37	101.9%	4%
Fe2O3	NIST 1633a	13.45	13.77	13.12		13.45	100.0%	5%
CaO	NIST 1633a	1.55	1.59	1.40		1.50	96.5%	13%
MgO	NIST 1633a	0.75	0.74	0.80		0.77	102.7%	8%
Na2O	NIST 1633a	0.23	0.22	0.26		0.24	104.3%	17%
K2O	NIST 1633a	2.27	2.24	2.53		2.39	105.1%	12%
P2O5	NIST 1633a	0.42	0.44	0.42		0.43	102.4%	5%
SO3	NIST 1633a	0.37	0.31	0.39		0.35	94.6%	23%
Average							101.1%	

Calculation of % RPD for WESTON Clay Boswell Coal Samples

Analysis Reported by % on an "As-Determined" Basis Unless Noted

Moisture Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	17.68	17.65	0.03	17.67	0.17
# 2-2	16.45	16.45	0.00	16.45	0.00
# 2-3	16.11	16.10	0.01	16.11	0.06
# 3-1	15.45	15.35	0.10	15.40	0.65
# 3-2	16.95	16.79	0.16	16.87	0.95
# 3-3	18.44	18.44	0.00	18.44	0.00
# 4-1	15.32	15.31	0.01	15.32	0.07
# 4-2	16.20	16.17	0.03	16.19	0.19
# 4-3	15.24	15.23	0.01	15.24	0.07

Average Relative Percent Difference **0.24**

Ash Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	6.05	5.99	0.06	6.02	1.00
# 2-2	6.67	6.65	0.02	6.66	0.30
# 2-3	6.82	6.80	0.02	6.81	0.29
# 3-1	6.51	6.46	0.05	6.49	0.77
# 3-2	6.79	6.73	0.06	6.76	0.89
# 3-3	6.98	6.95	0.03	6.97	0.43
# 4-1	6.16	6.15	0.01	6.16	0.16
# 4-2	6.24	6.24	0.00	6.24	0.00
# 4-3	7.32	7.30	0.02	7.31	0.27

Average Relative Percent Difference **0.46**

VM Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	35.41	35.09	0.32	35.25	0.91
# 2-2	36.21	35.87	0.34	36.04	0.94
# 2-3	36.34	35.96	0.38	36.15	1.05
# 3-1	36.11	36.03	0.08	36.07	0.22
# 3-2	35.37	35.35	0.02	35.36	0.06
# 3-3	34.34	34.28	0.06	34.31	0.17
# 4-1	36.36	36.35	0.01	36.36	0.03
# 4-2	35.94	35.87	0.07	35.91	0.19
# 4-3	36.40	36.25	0.15	36.33	0.41

Average Relative Percent Difference **0.44**

Carbon Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	58.42	58.15	0.27	58.29	0.46
# 2-2	58.59	58.58	0.01	58.59	0.02
# 2-3	59.18	58.85	0.33	59.02	0.56
# 3-1	59.70	59.58	0.12	59.64	0.20
# 3-2	58.53	58.43	0.10	58.48	0.17
# 3-3	57.14	56.98	0.16	57.06	0.28
# 4-1	60.03	60.03	0.00	60.03	0.00
# 4-2	59.71	59.24	0.47	59.48	0.79
# 4-3	59.00	58.70	0.30	58.85	0.51

Average Relative Percent Difference **0.33**

Hydrogen Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	5.81	5.74	0.07	5.78	1.21
# 2-2	5.70	5.66	0.04	5.68	0.70
# 2-3	5.70	5.62	0.08	5.66	1.41
# 3-1	5.56	5.55	0.01	5.56	0.18
# 3-2	5.64	5.61	0.03	5.63	0.53
# 3-3	5.68	5.60	0.08	5.64	1.42
# 4-1	5.55	5.52	0.03	5.54	0.54
# 4-2	5.70	5.56	0.14	5.63	2.49
# 4-3	5.45	5.39	0.06	5.42	1.11

Average Relative Percent Difference **1.07**

Nitrogen Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.84	0.79	0.05	0.82	6.13
# 2-2	0.81	0.76	0.05	0.79	6.37
# 2-3	0.87	0.87	0.00	0.87	0.00
# 3-1	0.85	0.82	0.03	0.84	3.59
# 3-2	0.86	0.82	0.04	0.84	4.76
# 3-3	0.81	0.80	0.01	0.81	1.24
# 4-1	0.82	0.78	0.04	0.80	5.00
# 4-2	0.83	0.83	0.00	0.83	0.00
# 4-3	0.86	0.84	0.02	0.85	2.35

Average Relative Percent Difference **3.27**

Sulfur Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.52	0.50	0.02	0.51	3.92
# 2-2	0.53	0.51	0.02	0.52	3.85
# 2-3	0.58	0.56	0.02	0.57	3.51
# 3-1	0.52	0.51	0.01	0.52	1.94
# 3-2	0.63	0.62	0.01	0.63	1.60
# 3-3	0.56	0.55	0.01	0.56	1.80
# 4-1	0.46	0.45	0.01	0.46	2.20
# 4-2	0.48	0.48	0.00	0.48	0.00
# 4-3	0.51	0.51	0.00	0.51	0.00

Average Relative Percent Difference **2.09**

Chlorine Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	<0.01	<0.01	0.00	0.00	0.00
# 2-2	<0.01	<0.01	0.00	0.00	0.00
# 2-3	<0.01	<0.01	0.00	0.00	0.00
# 3-1	<0.01	<0.01	0.00	0.00	0.00
# 3-2	<0.01	<0.01	0.00	0.00	0.00
# 3-3	<0.01	<0.01	0.00	0.00	0.00
# 4-1	<0.01	<0.01	0.00	0.00	0.00
# 4-2	<0.01	<0.01	0.00	0.00	0.00
# 4-3	<0.01	<0.01	0.00	0.00	0.00

Average Relative Percent Difference **0.00**

Mercury Determination (ppm):

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.067	0.060	0.007	0.064	11.02
# 2-2	0.038	0.037	0.001	0.038	2.67
# 2-3	0.044	0.038	0.006	0.041	14.63
# 3-1	0.048	0.047	0.001	0.048	2.11
# 3-2	0.070	0.066	0.004	0.068	5.88
# 3-3	0.066	0.043	0.023	0.055	42.20
# 4-1	0.048	0.044	0.004	0.046	8.70
# 4-2	0.058	0.057	0.001	0.058	1.74
# 4-3	0.062	0.055	0.007	0.059	11.97

Average Relative Percent Difference **11.21**

Btu Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	10016	10004	12	10010	0.12
# 2-2	10100	10097	3	10099	0.03
# 2-3	10164	10138	26	10151	0.26
# 3-1	10227	10198	29	10213	0.28
# 3-2	10030	10008	22	10019	0.22
# 3-3	9776	9753	23	9765	0.24
# 4-1	10236	10215	21	10226	0.21
# 4-2	10235	10211	24	10223	0.23
# 4-3	10088	10066	22	10077	0.22

Average Relative Percent Difference **0.20**

SiO2 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	35.58	35.26	0.32	35.42	0.90
# 2-2	37.18	36.73	0.45	36.96	1.22
# 2-3	37.88	37.82	0.06	37.85	0.16
# 3-1	37.83	37.28	0.55	37.56	1.46
# 3-2	36.14	35.96	0.18	36.05	0.50
# 3-3	39.25	38.52	0.73	38.89	1.88
# 4-1	38.11	37.20	0.91	37.66	2.42
# 4-2	40.37	40.09	0.28	40.23	0.70
# 4-3	42.74	42.39	0.35	42.57	0.82

Average Relative Percent Difference **1.12**

Al2O3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	17.00	16.85	0.15	16.93	0.89
# 2-2	17.16	16.85	0.31	17.01	1.82
# 2-3	17.34	17.33	0.01	17.34	0.06
# 3-1	17.96	17.79	0.17	17.88	0.95
# 3-2	17.07	16.89	0.18	16.98	1.06
# 3-3	17.55	17.31	0.24	17.43	1.38
# 4-1	18.61	18.40	0.21	18.51	1.13
# 4-2	18.04	17.88	0.16	17.96	0.89
# 4-3	17.80	17.79	0.01	17.80	0.06

Average Relative Percent Difference **0.92**

TiO2 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.90	0.87	0.03	0.89	3.39
# 2-2	0.93	0.90	0.03	0.92	3.28
# 2-3	0.94	0.92	0.02	0.93	2.15
# 3-1	0.93	0.91	0.02	0.92	2.17
# 3-2	0.91	0.90	0.01	0.91	1.10
# 3-3	0.89	0.89	0.00	0.89	0.00
# 4-1	0.93	0.93	0.00	0.93	0.00
# 4-2	0.94	0.92	0.02	0.93	2.15
# 4-3	0.86	0.86	0.00	0.86	0.00

Average Relative Percent Difference **1.58**

Fe2O3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	5.83	5.56	0.27	5.70	4.74
# 2-2	5.49	5.42	0.07	5.46	1.28
# 2-3	6.22	6.22	0.00	6.22	0.00
# 3-1	5.06	5.00	0.06	5.03	1.19
# 3-2	6.28	6.18	0.10	6.23	1.61
# 3-3	4.83	4.81	0.02	4.82	0.41
# 4-1	4.38	4.22	0.16	4.30	3.72
# 4-2	4.69	4.51	0.18	4.60	3.91
# 4-3	4.30	4.23	0.07	4.27	1.64

Average Relative Percent Difference **2.06**

CaO Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	15.44	15.38	0.06	15.41	0.39
# 2-2	16.63	16.38	0.25	16.51	1.51
# 2-3	15.37	15.32	0.05	15.35	0.33
# 3-1	15.24	15.10	0.14	15.17	0.92
# 3-2	15.31	15.31	0.00	15.31	0.00
# 3-3	14.70	14.60	0.10	14.65	0.68
# 4-1	14.77	14.61	0.16	14.69	1.09
# 4-2	13.60	13.55	0.05	13.58	0.37
# 4-3	12.83	12.69	0.14	12.76	1.10

Average Relative Percent Difference **0.71**

MgO Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	4.09	4.07	0.02	4.08	0.49
# 2-2	4.03	3.93	0.10	3.98	2.51
# 2-3	3.90	3.88	0.02	3.89	0.51
# 3-1	4.16	4.14	0.02	4.15	0.48
# 3-2	4.01	3.94	0.07	3.98	1.76
# 3-3	4.09	4.07	0.02	4.08	0.49
# 4-1	4.35	4.33	0.02	4.34	0.46
# 4-2	3.75	3.75	0.00	3.75	0.00
# 4-3	3.65	3.62	0.03	3.64	0.83

Average Relative Percent Difference **0.84**

Na2O Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	3.19	3.16	0.03	3.18	0.94
# 2-2	2.55	2.48	0.07	2.52	2.78
# 2-3	2.35	2.35	0.00	2.35	0.00
# 3-1	1.92	1.91	0.01	1.92	0.52
# 3-2	1.82	1.78	0.04	1.80	2.22
# 3-3	1.94	1.93	0.01	1.94	0.52
# 4-1	2.27	2.26	0.01	2.27	0.44
# 4-2	2.30	2.30	0.00	2.30	0.00
# 4-3	1.70	1.69	0.01	1.70	0.59

Average Relative Percent Difference **0.89**

K2O Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.57	0.56	0.01	0.57	1.77
# 2-2	0.56	0.55	0.01	0.56	1.80
# 2-3	0.62	0.61	0.01	0.62	1.63
# 3-1	0.43	0.43	0.00	0.43	0.00
# 3-2	0.35	0.33	0.02	0.34	5.88
# 3-3	0.32	0.32	0.00	0.32	0.00
# 4-1	0.48	0.46	0.02	0.47	4.26
# 4-2	0.75	0.74	0.01	0.75	1.34
# 4-3	0.78	0.78	0.00	0.78	0.00

Average Relative Percent Difference **1.85**

P2O5 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	0.22	0.22	0.00	0.22	0.00
# 2-2	0.24	0.23	0.01	0.24	4.26
# 2-3	0.25	0.24	0.01	0.25	4.08
# 3-1	0.30	0.29	0.01	0.30	3.39
# 3-2	0.27	0.27	0.00	0.27	0.00
# 3-3	0.25	0.25	0.00	0.25	0.00
# 4-1	0.34	0.34	0.00	0.34	0.00
# 4-2	0.34	0.34	0.00	0.34	0.00
# 4-3	0.31	0.31	0.00	0.31	0.00

Average Relative Percent Difference **1.30**

SO3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-1	16.52	16.46	0.06	16.49	0.36
# 2-2	15.27	14.77	0.50	15.02	3.33
# 2-3	14.92	14.90	0.02	14.91	0.13
# 3-1	15.87	15.79	0.08	15.83	0.51
# 3-2	16.64	16.38	0.26	16.51	1.57
# 3-3	15.70	15.66	0.04	15.68	0.26
# 4-1	15.36	15.26	0.10	15.31	0.65
# 4-2	14.93	14.92	0.01	14.93	0.07
# 4-3	14.33	14.19	0.14	14.26	0.98

Average Relative Percent Difference **0.87**

Calculation of % RPD for WESTON Clay Boswell Fly Ash Samples

Analysis Reported by % on an "As-Determined" Basis Unless Noted

Moisture Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	0.10	0.10	0.00	0.10	0.00
# 2-BH2	0.08	0.03	0.05	0.06	NA
# 2-BH3	0.07	0.06	0.01	0.07	15.38
# 3-PS1	1.73	1.67	0.06	1.70	3.53
# 3-PS2	1.70	1.66	0.04	1.68	2.38
# 3-PS3	2.27	2.26	0.01	2.27	0.44
#4-FGD1	16.60	15.76	0.84	16.18	5.19
#4-FGD2	9.28	9.27	0.01	9.28	0.11
#4-FGD3	9.46	9.46	0.00	9.46	0.00
# 4-ESP1	0.01	0.01	0.00	0.01	0.00
# 4-ESP2	0.01	0.01	0.00	0.01	0.00
# 4-ESP3	0.01	0.01	0.00	0.01	0.00

Average Relative Percent Difference **2.25**

Ash Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	98.31	98.31	0.00	98.31	0.00
# 2-BH2	98.60	98.56	0.04	98.58	0.04
# 2-BH3	98.99	98.98	0.01	98.99	0.01
# 3-PS1	96.83	96.82	0.01	96.83	0.01
# 3-PS2	96.53	96.50	0.03	96.52	0.03
# 3-PS3	95.96	95.93	0.03	95.95	0.03
#4-FGD1	79.00	78.14	0.86	78.57	1.09
#4-FGD2	85.66	85.64	0.02	85.65	0.02
#4-FGD3	85.27	85.27	0.00	85.27	0.00
# 4-ESP1	99.88	99.86	0.02	99.87	0.02
# 4-ESP2	99.93	99.89	0.04	99.91	0.04
# 4-ESP3	99.86	99.85	0.01	99.86	0.01

Average Relative Percent Difference **0.11**

Sulfur Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	0.88	0.87	0.01	0.88	1.14
# 2-BH2	0.88	0.85	0.03	0.87	3.47
# 2-BH3	0.80	0.79	0.01	0.80	1.26
# 3-PS1	0.94	NS			
# 3-PS2	0.59	0.58	0.01	0.59	1.71
# 3-PS3	0.51	0.50	0.01	0.51	1.98
#4-FGD1	7.18	NS			
#4-FGD2	6.72	NS			
#4-FGD3	7.14	6.85	0.29	7.00	4.15
# 4-ESP1	0.45	0.45	0.00	0.45	0.00
# 4-ESP2	0.40	0.40	0.00	0.40	0.00
# 4-ESP3	0.43	0.44	-0.01	0.44	2.30

Average Relative Percent Difference **1.78**

Carbon Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	1.43	1.18	0.25	1.31	19.16
# 2-BH2	1.10	1.06	0.04	1.08	3.70
# 2-BH3	0.76	0.64	0.12	0.70	17.14
# 3-PS1	0.24	0.23	0.01	0.24	4.26
# 3-PS2	0.26	0.23	0.03	0.25	12.24
# 3-PS3	0.22	0.22	0.00	0.22	0.00
#4-FGD1	0.03	0.02	0.01	0.03	40.00
#4-FGD2	0.04	0.02	0.02	0.03	66.67
#4-FGD3	0.05	0.03	0.02	0.04	50.00
# 4-ESP1	0.03	0.02	0.01	0.03	40.00
# 4-ESP2	0.05	0.02	0.03	0.04	85.71
# 4-ESP3	0.04	0.03	0.01	0.04	28.57

Average Relative Percent Difference **30.62**

Mercury Determination (ppm):

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	0.973	0.960	0.013	0.967	1.35
# 2-BH2	0.943	0.912	0.031	0.928	3.34
# 2-BH3	0.893	0.892	0.001	0.893	0.11
# 3-PS1	0.077	0.073	0.004	0.075	5.33
# 3-PS2	0.043	0.039	0.004	0.041	9.76
# 3-PS3	0.035	0.035	0.000	0.035	0.00
#4-FGD1	0.018	0.017	0.001	0.018	5.71
#4-FGD2	0.031	0.016	0.015	0.024	63.83
#4-FGD3	0.040	0.015	0.025	0.028	90.91
# 4-ESP1	0.012	0.008	0.004	0.010	40.00
# 4-ESP2	0.017	0.014	0.003	0.016	19.35
# 4-ESP3	0.012	0.011	0.001	0.012	8.70

Average Relative Percent Difference **20.70**

SiO2 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	42.91	42.57	0.34	42.74	0.80
# 2-BH2	41.92	41.76	0.16	41.84	0.38
# 2-BH3	40.97	40.95	0.02	40.96	0.05
# 3-PS1	42.06	NS			
# 3-PS2	43.21	43.09	0.12	43.15	0.28
# 3-PS3	44.56	44.18	0.38	44.37	0.86
#4-FGD1	26.13	NS			
#4-FGD2	31.33	NS			
#4-FGD3	30.92	30.54	0.38	30.73	1.24
# 4-ESP1	43.21	42.56	0.65	42.89	1.52
# 4-ESP2	46.93	46.84	0.09	46.89	0.19
# 4-ESP3	47.72	47.46	0.26	47.59	0.55

Average Relative Percent Difference **0.65**

Al2O3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	20.29	20.25	0.04	20.27	0.20
# 2-BH2	20.57	20.54	0.03	20.56	0.15
# 2-BH3	21.01	20.88	0.13	20.95	0.62
# 3-PS1	22.26	NS			
# 3-PS2	22.09	21.92	0.17	22.01	0.77
# 3-PS3	21.65	21.64	0.01	21.65	0.05
#4-FGD1	13.49	NS			
#4-FGD2	14.82	NS			
#4-FGD3	14.54	14.36	0.18	14.45	1.25
# 4-ESP1	21.42	21.17	0.25	21.30	1.17
# 4-ESP2	21.16	21.06	0.10	21.11	0.47
# 4-ESP3	21.22	21.06	0.16	21.14	0.76

Average Relative Percent Difference **0.60**

TiO2 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	1.00	0.99	0.01	1.00	1.01
# 2-BH2	0.99	0.97	0.02	0.98	2.04
# 2-BH3	1.00	1.00	0.00	1.00	0.00
# 3-PS1	1.17	NS			
# 3-PS2	1.18	1.15	0.03	1.17	2.58
# 3-PS3	1.06	1.04	0.02	1.05	1.90
#4-FGD1	0.64	NS			
#4-FGD2	0.75	NS			
#4-FGD3	0.75	0.73	0.02	0.74	2.70
# 4-ESP1	1.06	1.04	0.02	1.05	1.90
# 4-ESP2	1.04	1.03	0.01	1.04	0.97
# 4-ESP3	1.06	1.02	0.04	1.04	3.85

Average Relative Percent Difference **1.88**

Fe2O3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	5.98	5.86	0.12	5.92	2.03
# 2-BH2	5.40	5.33	0.07	5.37	1.30
# 2-BH3	5.11	5.04	0.07	5.08	1.38
# 3-PS1	4.64	NS			
# 3-PS2	4.77	4.72	0.05	4.75	1.05
# 3-PS3	4.48	4.35	0.13	4.42	2.94
#4-FGD1	2.30	NS			
#4-FGD2	3.05	NS			
#4-FGD3	2.79	2.78	0.01	2.79	0.36
# 4-ESP1	5.18	5.09	0.09	5.14	1.75
# 4-ESP2	4.76	4.69	0.07	4.73	1.48
# 4-ESP3	4.48	4.35	0.13	4.42	2.94

Average Relative Percent Difference **1.69**

CaO Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	17.18	16.91	0.27	17.05	1.58
# 2-BH2	18.24	18.14	0.10	18.19	0.55
# 2-BH3	18.80	18.74	0.06	18.77	0.32
# 3-PS1	15.78	NS			
# 3-PS2	15.49	15.30	0.19	15.40	1.23
# 3-PS3	14.80	14.79	0.01	14.80	0.07
#4-FGD1	12.48	NS			
#4-FGD2	12.22	NS			
#4-FGD3	12.98	12.50	0.48	12.74	3.77
# 4-ESP1	18.09	17.92	0.17	18.01	0.94
# 4-ESP2	16.44	16.42	0.02	16.43	0.12
# 4-ESP3	15.93	15.73	0.20	15.83	1.26

Average Relative Percent Difference **1.09**

MgO Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	4.41	4.40	0.01	4.41	0.23
# 2-BH2	4.61	4.54	0.07	4.58	1.53
# 2-BH3	4.75	4.73	0.02	4.74	0.42
# 3-PS1	4.16	NS			
# 3-PS2	4.33	4.26	0.07	4.30	1.63
# 3-PS3	4.13	4.11	0.02	4.12	0.49
#4-FGD1	1.90	NS			
#4-FGD2	1.73	NS			
#4-FGD3	1.68	1.66	0.02	1.67	1.20
# 4-ESP1	4.73	4.68	0.05	4.71	1.06
# 4-ESP2	4.10	4.08	0.02	4.09	0.49
# 4-ESP3	4.01	3.99	0.02	4.00	0.50

Average Relative Percent Difference **0.84**

Na2O Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	3.03	3.02	0.01	3.03	0.33
# 2-BH2	2.97	2.94	0.03	2.96	1.02
# 2-BH3	3.04	3.02	0.02	3.03	0.66
# 3-PS1	2.50	NS			
# 3-PS2	2.47	2.43	0.04	2.45	1.63
# 3-PS3	2.22	2.22	0.00	2.22	0.00
#4-FGD1	1.42	NS			
#4-FGD2	1.53	NS			
#4-FGD3	1.56	1.55	0.01	1.56	0.64
# 4-ESP1	2.37	2.34	0.03	2.36	1.27
# 4-ESP2	2.24	2.22	0.02	2.23	0.90
# 4-ESP3	2.49	2.45	0.04	2.47	1.62

Average Relative Percent Difference **0.90**

K2O Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	0.68	0.66	0.02	0.67	2.99
# 2-BH2	0.72	0.69	0.03	0.71	4.26
# 2-BH3	0.71	0.69	0.02	0.70	2.86
# 3-PS1	0.53	NS			
# 3-PS2	0.57	0.57	0.00	0.57	0.00
# 3-PS3	0.53	0.52	0.01	0.53	1.90
#4-FGD1	0.41	NS			
#4-FGD2	0.51	NS			
#4-FGD3	0.57	0.56	0.01	0.57	1.77
# 4-ESP1	0.55	0.55	0.00	0.55	0.00
# 4-ESP2	0.93	0.92	0.01	0.93	1.08
# 4-ESP3	1.05	1.03	0.02	1.04	1.92

Average Relative Percent Difference **1.86**

P2O5 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	0.33	0.32	0.01	0.33	3.08
# 2-BH2	0.34	0.33	0.01	0.34	2.99
# 2-BH3	0.33	0.32	0.01	0.33	3.08
# 3-PS1	0.37	NS			
# 3-PS2	0.38	0.37	0.01	0.38	2.67
# 3-PS3	0.34	0.33	0.01	0.34	2.99
#4-FGD1	0.21	NS			
#4-FGD2	0.24	NS			
#4-FGD3	0.23	0.23	0.00	0.23	0.00
# 4-ESP1	0.35	0.35	0.00	0.35	0.00
# 4-ESP2	0.34	0.33	0.01	0.34	2.99
# 4-ESP3	0.34	0.34	0.00	0.34	0.00

Average Relative Percent Difference **1.98**

SO3 Determination:

Sample	Run 1	Run 2	R1-R2	Avg	RPD
# 2-BH1	2.20	2.17	0.03	2.19	1.37
# 2-BH2	2.21	2.13	0.08	2.17	3.69
# 2-BH3	2.00	1.97	0.03	1.99	1.51
# 3-PS1	2.35	NS			
# 3-PS2	1.48	1.45	0.03	1.47	2.05
# 3-PS3	1.27	1.24	0.03	1.26	2.39
#4-FGD1	17.95	NS			
#4-FGD2	16.80	NS			
#4-FGD3	17.86	17.13	0.73	17.50	4.17
# 4-ESP1	1.13	1.12	0.01	1.13	0.89
# 4-ESP2	1.01	0.99	0.02	1.00	2.00
# 4-ESP3	1.12	1.08	0.04	1.10	3.64

Average Relative Percent Difference **2.41**

Minnesota Power - Clay Boswell Station
QCCS Sumarry for Liquid Analysis
Dry Basis - All Results Are mg/L Unless Noted

Parameter	QC Sample	QCCS Value	R-1	R-2	R-3	R-4	Avg	% Rec	PRSD
Mercury, ug/L	NIST 1641d	8.01	8.80	8.91	8.93	9.06	8.93	111%	1.2%
Aluminum	VHG Labs	50.0	48.3				48.3	97%	NA
Calcium	"	50.0	54.0				54.0	108%	NA
Total Iron	"	50.0	50.0				50.0	100%	NA
Magnessium	"	50.0	48.5				48.5	97%	NA
Potassium	"	20.0	19.4				19.4	97%	NA
Sodium	"	50.0	46.3				46.3	93%	NA
Silicon	"	50.0	51.2				51.2	102%	NA
Titanium	"	10.0	10.2				10.2	102%	NA
Phosphorus	"	10.0	10.3				10.3	103%	NA
Sulfur	"	200.0	198.8				198.8	99%	NA
Average								101%	

Calculation of % RPD for WESTON Clay Boswell Liquid Samples

All units are mg/L unless noted

Aluminum:

Sample	AVG	SDEV	%RPD
# 3-OS1	16.43	0.26	1.6%
# 3-OS2	18.87	0.21	1.1%
# 3-OS3	22.20	0.27	1.2%
# 3-F1	20.28	0.21	1.0%
# 3-F2	16.00	0.70	4.4%
# 3-F3	14.11	0.22	1.6%
#4-OS1	<0.05	0.00	0.0%
#4-OS2	<0.05	0.00	0.0%
#4-OS3	<0.05	0.00	0.0%
# 4-F1	225	1	0.4%
# 4-F2	259	3	1.2%
# 4-F3	293	3	1.0%

Average Relative Percent Differ **1.1%**

Calcium:

Sample	AVG	SDEV	%RPD
# 3-OS1	655	10	1.5%
# 3-OS2	701	7	1.0%
# 3-OS3	697	10	1.4%
# 3-F1	769	8	1.0%
# 3-F2	774	16	2.1%
# 3-F3	726	29	4.0%
#4-OS1	44.21	0.11	0.2%
#4-OS2	43.09	0.05	0.1%
#4-OS3	43.99	0.23	0.5%
# 4-F1	416	1	0.2%
# 4-F2	412	1	0.2%
# 4-F3	436	3	0.7%

Average Relative Percent Differ **1.1%**

Iron:

Sample	AVG	SDEV	%RPD
# 3-OS1	1.15	0.02	1.7%
# 3-OS2	1.35	0.01	0.7%
# 3-OS3	1.52	0.02	1.3%
# 3-F1	1.03	0.01	1.0%
# 3-F2	0.67	0.02	3.0%
# 3-F3	0.63	0.02	3.2%
#4-OS1	1.98	0.01	0.5%
#4-OS2	2.00	0.01	0.5%
#4-OS3	1.92	0.01	0.5%
# 4-F1	3.80	0.01	0.3%
# 4-F2	3.76	0.02	0.5%
# 4-F3	4.09	0.03	0.7%

Average Relative Percent Differ **1.2%**

Magnesium:

Sample	AVG	SDEV	%RPD
# 3-OS1	131	2	1.5%
# 3-OS2	139	1	0.7%
# 3-OS3	136	2	1.5%
# 3-F1	139	1	0.7%
# 3-F2	132	4	3.0%
# 3-F3	128	3	2.3%
#4-OS1	15.05	0.03	0.2%
#4-OS2	14.58	0.11	0.8%
#4-OS3	14.84	0.10	0.7%
# 4-F1	10370	84	0.8%
# 4-F2	10640	101	0.9%
# 4-F3	10270	23	0.2%

Average Relative Percent Differ **1.1%**

Potassium:

Sample	AVG	SDEV	%RPD
# 3-OS1	6.27	0.09	1.4%
# 3-OS2	6.66	0.03	0.5%
# 3-OS3	6.31	0.14	2.2%
# 3-F1	6.43	0.15	2.3%
# 3-F2	5.58	0.11	2.0%
# 3-F3	5.57	0.13	2.3%
#4-OS1	2.18	0.02	0.9%
#4-OS2	2.09	0.09	4.3%
#4-OS3	2.17	0.03	1.4%
# 4-F1	140	1	0.7%
# 4-F2	142	2	1.4%
# 4-F3	138	2	1.4%

Average Relative Percent Differ **1.7%**

Sodium:

Sample	AVG	SDEV	%RPD
# 3-OS1	24.90	0.86	3.5%
# 3-OS2	25.90	0.50	1.9%
# 3-OS3	24.95	0.32	1.3%
# 3-F1	24.60	0.39	1.6%
# 3-F2	21.32	1.17	5.5%
# 3-F3	21.60	0.30	1.4%
#4-OS1	3.99	0.01	0.3%
#4-OS2	3.86	0.04	1.0%
#4-OS3	3.99	0.06	1.5%
# 4-F1	1199	7	0.6%
# 4-F2	1197	12	1.0%
# 4-F3	1158	10	0.9%

Average Relative Percent Differ **1.7%**

Phosphorus:

Sample	AVG	SDEV	%RPD
# 3-OS1	0.14	0.03	21.4%
# 3-OS2	0.20	0.02	10.0%
# 3-OS3	0.22	0.03	13.6%
# 3-F1	0.14	0.01	7.1%
# 3-F2	0.14	0.01	7.1%
# 3-F3	0.10	0.01	10.0%
#4-OS1	<0.05	0.00	0.0%
#4-OS2	<0.05	0.00	0.0%
#4-OS3	<0.05	0.00	0.0%
# 4-F1	2.17	0.05	2.3%
# 4-F2	2.21	0.03	1.4%
# 4-F3	2.05	0.08	3.9%

Average Relative Percent Differ **6.4%**

Titanium:

Sample	AVG	SDEV	%RPD
# 3-OS1	0.38	0.01	2.6%
# 3-OS2	0.43	0.00	0.0%
# 3-OS3	0.46	0.01	2.2%
# 3-F1	0.27	0.00	0.0%
# 3-F2	0.21	0.01	4.8%
# 3-F3	0.21	0.01	4.8%
#4-OS1	0.06	0.00	0.0%
#4-OS2	0.06	0.00	0.0%
#4-OS3	0.06	0.00	0.0%
# 4-F1	1.21	0.00	0.0%
# 4-F2	0.98	0.01	1.0%
# 4-F3	0.76	0.01	1.3%

Average Relative Percent Differ **1.4%**

Silicon:

Sample	AVG	SDEV	%RPD
# 3-OS1	52.55	0.71	1.4%
# 3-OS2	56.50	0.17	0.3%
# 3-OS3	56.64	0.70	1.2%
# 3-F1	59.27	0.36	0.6%
# 3-F2	56.58	1.60	2.8%
# 3-F3	52.48	1.33	2.5%
#4-OS1	2.18	0.01	0.5%
#4-OS2	2.13	0.02	0.9%
#4-OS3	2.20	0.02	0.9%
# 4-F1	93.2	0.3	0.3%
# 4-F2	116.7	1.0	0.9%
# 4-F3	127.5	1.1	0.9%

Average Relative Percent Differ **1.1%**

Sulfur:

Sample	AVG	SDEV	%RPD
# 3-OS1	736	10	1.4%
# 3-OS2	779	2	0.3%
# 3-OS3	757	9	1.2%
# 3-F1	824	6	0.7%
# 3-F2	799	21	2.6%
# 3-F3	757	21	2.8%
#4-OS1	3.65	0.05	1.4%
#4-OS2	3.34	0.01	0.3%
#4-OS3	3.26	0.03	0.9%
# 4-F1	15280	135	0.9%
# 4-F2	15857	166	1.0%
# 4-F3	15447	75	0.5%

Average Relative Percent Differ **1.2%**

Manganese:

Sample	AVG	SDEV	%RPD
# 3-OS1	1.50	0.02	1.3%
# 3-OS2	1.59	0.01	0.6%
# 3-OS3	1.73	0.02	1.2%
# 3-F1	1.74	0.01	0.6%
# 3-F2	1.67	0.05	3.0%
# 3-F3	1.75	0.05	2.9%
#4-OS1	0.28	0.00	0.0%
#4-OS2	0.28	0.00	0.0%
#4-OS3	0.28	0.00	0.0%
# 4-F1	8.31	0.02	0.2%
# 4-F2	7.94	0.10	1.3%
# 4-F3	6.45	0.06	0.9%

Average Relative Percent Differ **1.0%**

Mercury (ug/L:

Sample	AVG	SDEV	%RPD
# 3-OS1	0.77	0.26	33.8%
# 3-OS2	0.92	0.37	40.4%
# 3-OS3	0.74	0.08	10.8%
# 3-F1	0.91	0.39	43.1%
# 3-F2	0.79	0.12	15.2%
# 3-F3	1.00	0.41	41.2%
#4-OS1	0.67	0.22	32.8%
#4-OS2	0.91	0.01	1.1%
#4-OS3	0.56	0.10	17.9%
# 4-F1	2.50	0.40	16.0%
# 4-F2	2.85	0.10	3.5%
# 4-F3	2.55	0.30	11.8%

Average Relative Percent Differ **22.3%**

APPENDIX E
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR FLOW, MOISTURE AND ISOKINETICS

Client: DOE - MINNESOTA POWER

Test Number: Run 1 | Test Date: 3/23/00

Test Location: Unit 2 Inlet | Test Period: 1245-1508

1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left(Pb + \frac{delta\ H}{13.6} \right)}{(Tm + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0072 \times 76.043 \times \left(28.70 + \frac{1.215}{13.6} \right)}{89.40 + 460} = 70.797$$

Where:

Vm(std) =	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
Vm =	Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
Pb =	barometric Pressure, in Hg.
delt H =	Average pressure drop across the orifice meter, in H_2O
Tm =	Average dry gas meter temperature , deg F.
Y =	Dry gas meter calibration factor.
17.64 =	Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
13.6 =	Specific gravity of mercury.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

Vw(std) = (0.04707 x Vwc) + (0.04715 x Wwsg)

Vw(std) = (0.04707 x 162.7) + (0.04715 x 14.1) = 8.323

Where:

Vw(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
Vwc =	Volume of liquid condensed in impingers, ml.
Wwsg =	Weight of water vapor collected in silica gel, g.
0.04707 =	Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.
0.04715 =	Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content

$$bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$bws = \frac{8.323}{8.323 + 70.797} = 0.105$$

Where:

bws = Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.105 = 0.895$$

Where:

Md = Mole fraction of dry gas, dimensionless.

5. Dry molecular weight of gas stream, lb/lb-mole.

$$MWd = (0.440 \times \% CO_2) + (0.320 \times \% O_2) + (0.280 \times (\% N_2 + \% CO))$$

$$MWd = (0.440 \times 13.6) + (0.320 \times 6.0) + (0.280 \times (80.4 + 0.00))$$

$$= 30.42$$

Where:

MWd = Dry molecular weight , lb/lb-mole.
% CO2 = Percent carbon dioxide by volume, dry basis.
% O_2 = Percent oxygen by volume, dry basis.
% N_2 = Percent nitrogen by volume, dry basis.
% CO = Percent carbon monoxide by volume, dry basis.
0.440 = Molecular weight of carbon dioxide, divided by 100.
0.320 = Molecular weight of oxygen, divided by 100.
0.280 = Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

$$MWs = (MWd \times Md) + (18 \times (1 - Md))$$

$$MWs = (30.42 \times 0.895) +(18 (1 - 0.895)) = 29.11$$

Where:

MWs = Molecular weight of wet gas, lb/lb-mole.
18 = Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$Vs = 85.49 \times Cp \times ((\text{delt } p)^{1/2})avg \times \left(\frac{Ts\ (avg)}{Ps \times MWs} \right)^{1/2}$$

$$Vs = 85.49 \times 0.84 \times 0.5808 \times \left(\frac{814}{27.89 \times 29.11} \right)^{1/2} = 41.8$$

Where:

Vs = Average gas stream velocity, ft/sec.

85.49 = Pitot tube constant, ft/sec x $\frac{(lb/lb\text{-}mole)(in.\ Hg)^{1/2}}{(deg\ R)(in\ H_2O)}$

Cp = Pitot tube coefficient, dimensionless.

Ts = Absolute gas stream temperature, deg R = Ts, deg F + 460.

Ps = Absolute gas stack pressure, in. Hg. = Pb + $\frac{P(static)}{13.6}$

delt p = Velocity head of stack, in. H_2O

8. Average gas stream volumetric flowrate at actual conditions, wacf/min.

$$Qs(act) = 60 \times Vs \times As$$

$$Qs(act) = 60 \times 41.76 \times 104.500 = 261814$$

Where:

Qs(act) = Volumetric flowrate of wet stack gas at actual conditions, wacf/min.

As = Cross-sectional area of stack, ft^2.

60 = Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flowrate at standard conditions, dscf/min.

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

$$Qs(std) = 17.64 \times 0.895 \times \frac{27.89}{814} \times 261814$$

$$= 141617$$

Where:

Qs(std) = Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

$$I = \frac{17.327 \times 814 \times 70.797}{41.76 \times 125 \times 27.89 \times 0.895 \times (0.275)^2} = 101.35$$

Where:

I =	Percent of isokinetic sampling.
O =	Total sampling time, minutes.
Dn =	Diameter of nozzle, inches.
17.327 =	Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle $D^{2/4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(in.\ Hg)(in^2)(min)}{(deg\ R)(ft^2)(sec)}$

SAMPLE CALCULATIONS FOR MERCURY

Client: DOE - MINNESOTA POWER

Test Number: Run 1 | Test Date: 3/23/00

Test Location: Unit 2 inlet | Test Period: 1245-1508

1. Total Mercury concentration, lb/dscf.

$$C1 = \frac{W \times 2.2046 \times 10E\text{-}9}{Vm(std)}$$

$$C1 = \frac{10.2741 \times 2.2046 \times 10E\text{-}9}{70.797}$$

$$= 3.20E\text{-}10$$

Where:

W	=	Weight of Total Mercury collected in sample in ug.
C1	=	Total Mercury concentration, lb/dscf.
2.2046x10-9	=	Conversion factor from ug to pounds.

2. Total Mercury concentration, ug/dscm

$$C2 = \frac{W}{Vm(std) \times 0.02832}$$

$$C2 = \frac{10.2741}{70.797 \times 0.02832}$$

$$= 5.13$$

Where:

C2	=	Total Mercury concentration, μg/dscm.
W	=	Total Mercury catch, μg.
0.02832	=	Conversion factor from cubic feet to cubic meters.

3. Total Mercury concentration, ug/Nm3

$$C3 = \frac{W}{Vm(std) \times 0.02832 \times (16.44/17.64)}$$

$$C3 = \frac{10.2741}{1.87}$$

$$C3 = 5.50$$

Where:

C3	=	Total Mercury concentration, ug/Nm3
W	=	Total Mercury catch, μg.
0.03	=	Conversion factor from cubic feet to cubic meters.
16.44/17.64	=	Ratio of conversion factors for standard temperature and pressure and normal temperature.

4. Total Mercury mass emission rate, lbs/hr.

MR1 = C1 x Qs(std) x 60

MR1 = 3.20E-10 x 141617 x 60

MR1 = 2.72E-03

Where:

MR1	=	Total Mercury mass emission rate, lbs/hr.
60	=	Conversion factor from minutes to hours.

5. Total Mercury mass emission rate, lbs/10E+12 Btu.

MR2 = MR1/F-Factor x 10E+6

MR2 = 2.72E-03 / 623.4 x 10E+6

MR2 = 4.36

Where:

MR2	=	Total Mercury mass emission rate, lbs/10E+12 Btu.
Heat Input(F-Factor)	=	623.4 x 10E+6 Btu/hr

APPENDIX F
EQUIPMENT CALIBRATION RECORDS

Long Cal and Temperature Dry Gas Meter Calibration Datasheet

Calibrator P. Mack

Date 4-Mar-00

Meter Box Number 7

Wet Test Meter Number P-2952

Dry Gas Meter Number 6842584

Ambinet Temp 72

Temp Reference Source Thermocouple Simulator (Accuracy +/- 1°F)

Setting	Gas Volume		Temperatures						
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_2O (Δ H)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_I)	Average, °F (Td)	Time, min (O)	Y	Δ H
0.5	6.0	934.917 940.989 6.072	71.5	79.50	83.00	81.3	15.0	1.0050	1.7670
1.0	5.0	940.989 946.100 5.111	72.0	83.50	86.50	85.0	9.0	0.9997	1.8229
1.5	10.0	946.100 956.421 10.321	72.0	86.50	91.00	88.8	15.2	0.9957	1.9365
2.0	10.0	956.421 966.834 10.413	73.0	89.50	94.50	92.0	13.2	0.9896	1.9430
3.0	10.0	966.834 977.290 10.456	73.0	92.50	98.00	95.3	10.7	0.9889	1.9039
							Average	0.99576	1.87466

Baro Press, in Hg (Pb)	29.26

Calibration Results

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
tw - Temp of gas in the wet test meter
tdi - Temp of the inlet gas of the dry gas meter
tdw - Temp of the oulet gas of the dry gas meter

td - Averge temp of the gas in the dry gas meter
0 - Time of calibration run
H - Pressure differental across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter
Pb - Barometic Pressure

Reference Temperature Select Tempemerature ○ °C ◉ °F	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
	Channel Number							
	1	2	3	4	5	6		
32	32	32	32	32	32		32.0	0%
212	212	212	212	212	212		212.0	0%
932	933	933	933	933	933		933.0	0%
1832	1827	1827	1827	1827	1827		1827.0	0%

1 - Channel Temps must agree with +/- 5°F or 3°C

2 - Acceptable Temperature Difference less than 1.5 %

No. 7

Y Factor Calibration Check Calculation

MWd	= Dry molecular weight source gas, lb/lb-mole.	
0.32	= Molecular weight of oxygen, divided by 100.	
0.44	= Molecular weight of carbon dioxide, divided by 100.	
0.28	= Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2	= Percent carbon dioxide by volume, dry basis.	12.73
% O_2	= Percent oxygen by volume, dry basis.	7.07

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 7.07) + (0.44 * 12.73) + (0.28 * (100 - (12.73 + 7.07)))$$

$$MWd = (2.26) + (5.60) + (22.46)$$

MWd = 30.32

Tma	= Source Temperature, absolute(°R)	
Tm	= Average dry gas meter temperature , deg F.	63.9

Tma = Ts + 460

Tma = 63.9 + 460

Tma = 523.9

Ps	= Absolute meter pressure, inches Hg.	
13.6	= Specific gravity of mercury.	
delta H	= Avg pressure drop across the orifice meter during sampling, in H2O	1.19
Pb	= Barometric Pressure, in Hg.	28.2

Pm = Pb + (delta H / 13.6)

Pm = 28.2 + (1.19 / 13.6)

Pm = 28.29

Yqa	= dry gas meter calibration check value, dimensionless.	
0.0319	= (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29	= dry molecular weight of air, lb/lb-mole.	
Vm	= Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	74.139
Y	= Dry gas meter calibration factor (based on full calibration)	0.99576
Delta H@	= Dry Gas meter orifice calibration coefficient, in. H2O.	1.87466
avg√Delta H	= Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.08698
O	= Total sampling time, minutes.	125

$$Yqa = (O / Vm) * \sqrt{(0.0319 * Tma * 29) / (Delta H@ * Pm * MWd)} * avg\sqrt{Delta H}$$

$$Yqa = (125 / 74.139) * \sqrt{(0.0319 * 523.9 * 29) / (1.87466 * 28.29 * 30.3196)} * 1.086977$$

$$Yqa = 1.686 * \sqrt{484.660 / 1,607.974} * 1.086977$$

Yqa = 1.006

Diff	= Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((0.99576 - 1.006) / 0.99576) * 100

Diff = 1.03

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WESTON

LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator E. Mack

Date 4/19/99 Meter Box Number 9 Plant

Barometric pressure, P_b = 29.59 in. Hg Dry Gas Meter Number 6843913 Comments

Setting	Gas volume		Temperatures						
Orifice manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
(Δ H) in. H_2O	(V_w) ft^3	(V_d) ft^3	(t_w) °F	Inlet (td_i) °F	Outlet (td_o) °F	Avg (t_d) °F	Time (θ), min	Y_i	ΔH @$_i$ in. H_2O
0.5	5	689.126 684.040	66.5	77, 80	76, 77	77.5	12.7	1.0024	1.7822
1.0	5	694.195 689.126	66.5	80, 84	77, 78	80	9.2	1.0092	1.8619
1.5	10	704.455 694.195	67	85, 90	78, 89	85.5	15.4	1.0097	1.9403
2.0	10	714.659 704.408	67	90, 95	81, 83	87	13.4	1.0075	1.9534
3.0	10	724.845 714.659	67	99, 99	83, 85	90	10.4	1.0071	1.9282
							Avg	Y 1.0072	Δ H @ 1.8932

If there is only one thermometer on the dry gas meter, record the temperature under td_o.

(ΔH) in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.59)(77.5+460)}{(5.086)(29.59+.0368)(66.5+460)}$	$\frac{(.0317)(.5)}{(29.59)(77.5+460)}\left[\frac{(66.5+460)(12.7)}{5}\right]^2$
1.0	0.0735	$\frac{(5)(29.59)(80+460)}{(5.069)(29.59+.0735)(66.5+460)}$	$\frac{(.0317)(1.0)}{(29.59)(80+460)}\left[\frac{(66.5+460)(9.2)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.59)(85.5+460)}{(10.213)(29.59+.110)(67+460)}$	$\frac{(.0317)(1.5)}{(29.59)(85.5+460)}\left[\frac{(67+460)(15.4)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.59)(87+460)}{(10.251)(29.59+.147)(67+460)}$	$\frac{(.0317)(2.0)}{(29.59)(87+460)}\left[\frac{(67+460)(13.4)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.59)(90+460)}{(10.286)(29.59+.221)(67+460)}$	$\frac{(.0317)(3.0)}{(29.59)(90+460)}\left[\frac{(67+460)(10.9)}{10}\right]^2$

WESTON

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 4/19/99
AMBIENT TEMPERATURE 66
CALIBRATION [illegible]

POTENTIOMETER NUMBER 2010 #9
BAROMETRIC PRESSURE 29.59
REFERENCE: THERMOCOUPLE SIMULATOR
(ACCURACY ± 1°F)

REFERENCE TEMPERATURE °C	°F	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER 1	2	3	4	5	AVERAGE TEMPERATURE READING ①	TEMPERATURE DIFFERENCE ② (%)
0	32	31	31	31	31	31	31	1° - .20%
100	212	212	212	212	212	212	212	0° - 0%
500	932	932	932	932	932	932	932	0° - 0%
1000	1832	1830	1830	1830	1830	1830	1830	2° - .09%

COMMENTS

① AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

② THE CHANNEL READINGS MUST AGREE WITHIN ± 5°F OR 3°C

ACCEPTABLE TEMPERATURE DIFFERNCE ≤ 1.5 = $\left(\frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)}\right) \times 100$

REFCAL-07

Ws.9

Y Factor Calibration Check Calculation

MWd	= Dry molecular weight source gas, lb/lb-mole.	
0.32	= Molecular weight of oxygen, divided by 100.	
0.44	= Molecular weight of carbon dioxide, divided by 100.	
0.28	= Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2	= Percent carbon dioxide by volume, dry basis.	13.8
% O_2	= Percent oxygen by volume, dry basis.	6

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 6) + (0.44 * 13.8) + (0.28 * (100 - (13.8 + 6)))$$

$$MWd = (1.92) + (6.07) + (22.46)$$

MWd = 30.45

Tma	= Source Temperature, absolute(°R)	
Tm	= Average dry gas meter temperature , deg F.	91.04

Tma = Ts + 460

Tma = 91.04 + 460

Tma = 551.04

Ps	= Absolute meter pressure, inches Hg.	
13.6	= Specific gravity of mercury.	
delta H	= Avg pressure drop across the orifice meter during sampling, in H2O	1.33291
Pb	= Barometric Pressure, in Hg.	28.5

Pm = Pb + (delta H / 13.6)

Pm = 28.5 + (1.33291 / 13.6)

Pm = 28.60

Yqa	= dry gas meter calibration check value, dimensionless.	
0.0319	= (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29	= dry molecular weight of air, lb/lb-mole.	
Vm	= Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	76.733
Y	= Dry gas meter calibration factor (based on full calibration)	1.0072
Delta H@	= Dry Gas meter orifice calibration coefficient, in. H2O.	1.8932
avg$\sqrt{\text{Delta H}}$	= Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.15312
O	= Total sampling time, minutes.	120

$$Yqa = (O / Vm) * \sqrt{(0.0319 * Tma * 29) / (Delta\ H@ * Pm * MWd)} * avg\sqrt{Delta\ H}$$

$$Yqa = (120 / 76.733) * \sqrt{0.0319 * 551.04 * 29) / (1.8932 * 28.60 * 30.448)} * 1.153122$$

$$Yqa = 1.564 * \sqrt{509.767 / 1{,}648.623} * 1.153122$$

Yqa = 1.003

Diff	= Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((1.0072 - 1.003) / 1.0072) * 100

Diff = 0.42

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WESTON

LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator P. Mack

Date 2/24/99 Meter Box Number 13 Plant

Barometric pressure, P_b = 29.98 in. Hg Dry Gas Meter Number 6848063 Comments

Setting	Gas volume		Temperatures						
Orifice manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
(Δ H) in. H_2O	(V_w) ft^3	(V_d) ft^3	(t_w) °F	Inlet (td_i) °F	Outlet (td_o) °F	Avg (t_d) °F	Time (θ), min	Y_i	ΔH @$_i$ in. H_2O
0.5	5	838.635 833.644	64	63, 63	61, 61	62	12.8	.9967	1.8225
1.0	5	843.644 838.635	64	63, 64	61, 61	62	9.3	.9920	1.9242
1.5	10	857.663 843.644	64	63, 66	61, 61	63	15.6	.9925	2.0225
2.0	10	863.715 853.663	64	65, 69	61, 61	64	13.6	.9900	2.0496
3.0	10	863.715	64	68, 72	61, 62	66	12.1	.9921	2.0402
							Avg	Y .9926	Δ H @ 1.9718

If there is only one thermometer on the dry gas meter, record the temperature under td_o.

(ΔH) in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.98)(62+460)}{(4.991)(29.98+.0368)(64+460)}$	$\frac{(.0317)(.5)}{(29.98)(62+460)}\left[\frac{(64+460)(12.8)}{5}\right]^2$
1.0	0.0735	$\frac{(5)(29.98)(62+460)}{(5.009)(29.98+.0735)(64+460)}$	$\frac{(.0317)(1.0)}{(29.98)(62+460)}\left[\frac{(64+460)(9.3)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.98)(63+460)}{(10.019)(29.98+.110)(64+460)}$	$\frac{(.0317)(1.5)}{(29.98)(64+460)}\left[\frac{(64+460)(15.6)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.98)(64+460)}{(10.052)(29.98+.147)(64+460)}$	$\frac{(.0317)(2.0)}{(29.98)(64+460)}\left[\frac{(64+460)(13.6)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.98)(66+460)}{(10.044)(29.98+.221)(64+460)}$	$\frac{(.0317)(3.0)}{(29.98)(66+460)}\left[\frac{(64+460)(12.1)}{10}\right]^2$

WESTON

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 2/24/99
AMBIENT TEMPERATURE 69
CALIBRATION [illegible]

POTENTIOMETER NUMBER 2010 #13
BAROMETRIC PRESSURE 29.88
REFERENCE: THERMOCOUPLE SIMULATOR
(ACCURACY ± 1°F)

REFERENCE TEMPERATURE °C	°F	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER 1	2	3	4	5	AVERAGE TEMPERATURE READING ①	TEMPERATURE DIFFERENCE ② (%)
0	32	32	32	32	32	32	32	0° – 0%
100	212	213	213	213	213	213	213	1° – .15%
500	932	931	931	931	931	931	931	1° – .07%
1000	1832	1830	1830	1830	1830	1830	1830	2° – .09%

COMMENTS

① AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

② THE CHANNEL READINGS MUST AGREE WITHIN ± 5°F OR 3°C

ACCEPTABLE TEMPERATURE DIFFERNCE ≤ 1.5 = $\left(\frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)}\right) \times 100$

ROTCAL-67

No. 13

Y Factor Calibration Check Calculation

MWd	= Dry molecular weight source gas, lb/lb-mole.	
0.32	= Molecular weight of oxygen, divided by 100.	
0.44	= Molecular weight of carbon dioxide, divided by 100.	
0.28	= Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2	= Percent carbon dioxide by volume, dry basis.	14.4
% O_2	= Percent oxygen by volume, dry basis.	5.2

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 5.2) + (0.44 * 14.4) + (0.28 * (100 - (14.4 + 5.2)))$$

$$MWd = (1.66) + (6.34) + (22.51)$$

MWd = 30.51

Tma	= Source Temperature, absolute(°R)	
Tm	= Average dry gas meter temperature , deg F.	46.6

Tma = Ts + 460

Tma = 46.6 + 460

Tma = 506.6

Ps	= Absolute meter pressure, inches Hg.	
13.6	= Specific gravity of mercury.	
delta H	= Avg pressure drop across the orifice meter during sampling, in H2O	1.00708
Pb	= Barometric Pressure, in Hg.	28.47

Pm = Pb + (delta H / 13.6)

Pm = 28.47 + (1.00708 / 13.6)

Pm = 28.54

Yqa	= dry gas meter calibration check value, dimensionless.	
0.0319	= (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29	= dry molecular weight of air, lb/lb-mole.	
Vm	= Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	65.19
Y	= Dry gas meter calibration factor (based on full calibration)	0.9926
Delta H@	= Dry Gas meter orifice calibration coefficient, in. H2O.	1.9718
avg√Delta H	= Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.9962
O	= Total sampling time, minutes.	120

$$Yqa = (O / Vm) * \sqrt{(0.0319 * Tma * 29) / (Delta\ H@ * Pm * MWd)} * avg\sqrt{Delta\ H}$$

$$Yqa = (120 / 65.19) * \sqrt{(0.0319 * 506.6 * 29) / (1.9718 * 28.54 * 30.512)} * 0.9962$$

$$Yqa = 1.841 * \sqrt{468.656 / 1,717.068} * 0.9962$$

Yqa = 0.958

Diff	= Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((0.9926 - 0.958) / 0.9926) * 100

Diff = 3.49

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WESTON

LONG/PRE DRY GAS METER CALIBRATION DATA FORM

Calibrator R. McCa

Date 10/08/99 Meter Box Number 8 Plant

Barometric pressure, P_b = 29.78 in. Hg Dry Gas Meter Number 6842672 Comments

Setting	Gas volume		Temperatures						
Orifice manometer	Wet test meter	Dry gas meter	Wet test meter	Dry gas meter					
(Δ H) in. H_2O	(V_w) ft^3	(V_d) ft^3	(t_w) °F	Inlet (td_i) °F	Outlet (td_o) °F	Avg (t_d) °F	Time (θ), min	Y_i	ΔH @$_i$ in. H_2O
0.5	5	82.025 76.945	71	81, 84	80, 80	81	11.9	.9996	1.5713
1.0	5	87.128 82.025	71	84, 87	80, 82	83	8.6	.9995	1.6352
1.5	10	97.372 87.128	71	85, 90	81, 83	85	14.5	.9982	1.7368
2.0	10	107.672 97.372	71	90, 93	84, 85	88	12.7	.9970	1.7668
3.0	10	118.020 107.672	71	94, 96	86, 87	91	10.4	.9954	1.7675
							Avg	Y .9979	Δ H @ 1.6955

If there is only one thermometer on the dry gas meter, record the temperature under td_o.

(ΔH) in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\Delta H@i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.78)(81+460)}{(5.08)(29.78+.0368)(71+460)}$	$\frac{(.0317)(.5)}{(29.78)(81+460)}\left[\frac{(71+460)(11.9)}{5}\right]^2$
1.0	0.0735	$\frac{(5)(29.78)(83+460)}{(5.103)(29.78+.0735)(71+460)}$	$\frac{(.0317)(1.0)}{(29.78)(83+460)}\left[\frac{(71+460)(8.6)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.78)(85+460)}{(10.244)(29.78+.110)(71+460)}$	$\frac{(.0317)(1.5)}{(29.78)(85+460)}\left[\frac{(71+460)(14.5)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.78)(88+460)}{(10.300)(29.78+.147)(71+460)}$	$\frac{(.0317)(2.0)}{(29.78)(88+460)}\left[\frac{(71+460)(12.7)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.78)(91+460)}{(10.348)(29.78+.221)(71+460)}$	$\frac{(.0317)(3.0)}{(29.78)(91+460)}\left[\frac{(71+460)(10.4)}{10}\right]^2$

WESTON

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

DATE 10/08/99
AMBIENT TEMPERATURE 71
CALIBRATION [illegible]

POTENTIOMETER NUMBER 2010 # 8
BAROMETRIC PRESSURE 29.78
REFERENCE: THERMOCOUPLE SIMULATOR
(ACCURACY ± 1°F)

REFERENCE TEMPERATURE °C	°F	TEMPERATURE READING FROM THERMOCOUPLE CHANNEL INPUT NUMBER 1	2	3	4	5	AVERAGE TEMPERATURE READING ①	TEMPERATURE DIFFERENCE ② (%)
0	32	32	32	32	32	32	32	0°–0%
100	212	214	214	214	214	214	214	2°–.30%
500	932	934	934	934	934	934	934	2°–.14%
1000	1832	1831	1831	1831	1831	1831	1831	1°–.04%

COMMENTS

① AVERAGE TEMPERATURE READING = MEAN OF THE TEMPERATURE READINGS FOR THE THERMOCOUPLE CHANNELS

② THE CHANNEL READINGS MUST AGREE WITHIN ± 5°F OR 3°C

ACCEPTABLE TEMPERATURE DIFFERNCE ≤ 1.5 = $\left(\frac{(\text{REF TEMP}^{\circ}\text{F} + 460) - (\text{TEST TEMP}^{\circ}\text{F} + 460)}{(\text{REF TEMP}^{\circ}\text{F} + 460)}\right) \times 100$

NO: 8

Y Factor Calibration Check Calculation

MWd	= Dry molecular weight source gas, lb/lb-mole.	
0.32	= Molecular weight of oxygen, divided by 100.	
0.44	= Molecular weight of carbon dioxide, divided by 100.	
0.28	= Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2	= Percent carbon dioxide by volume, dry basis.	13
% O_2	= Percent oxygen by volume, dry basis.	6.73

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 6.73) + (0.44 * 13) + (0.28 * (100 - (13 + 6.73)))$$

$$MWd = (2.15) + (5.72) + (22.48)$$

MWd = 30.35

Tma	= Source Temperature, absolute(°R)	
Tm	= Average dry gas meter temperature , deg F.	54.4

Tma = Ts + 460

Tma = 54.4 + 460

Tma = 514.4

Ps	= Absolute meter pressure, inches Hg.	
13.6	= Specific gravity of mercury.	
delta H	= Avg pressure drop across the orifice meter during sampling, in H2O	1.3008
Pb	= Barometric Pressure, in Hg.	28.7

Pm = Pb + (delta H / 13.6)

Pm = 28.7 + (1.3008 / 13.6)

Pm = 28.80

Yqa	= dry gas meter calibration check value, dimensionless.	
0.0319	= (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29	= dry molecular weight of air, lb/lb-mole.	
Vm	= Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	79.571
Y	= Dry gas meter calibration factor (based on full calibration)	0.9979
Delta H@	= Dry Gas meter orifice calibration coefficient, in. H2O.	1.6955
avg$\sqrt{\text{Delta H}}$	= Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.124
O	= Total sampling time, minutes.	125

$$Yqa = (O / Vm) * \sqrt{(0.0319 * Tma * 29) / (Delta H@ * Pm * MWd)} * avg\sqrt{Delta H}$$

$$Yqa = (125 / 79.571) * \sqrt{(0.0319 * 514.4 * 29) / (1.6955 * 28.80 * 30.3492)} * 1.124$$

$$Yqa = 1.571 * \sqrt{475.871 / 1{,}481.964} * 1.124$$

Yqa = 1.001

Diff	= Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((0.9979 - 1.001) / 0.9979) * 100

Diff = 0.31

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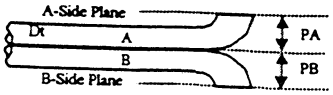
Standard Pitot Tube Inspection Data Form

Pitot Tube Identification Number: P-305 (17")

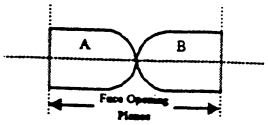
Inspection Date 5/3/00 Individual Conducting Inspection T.Belknap

If all Criteria PASS Cp is equal to 0.84

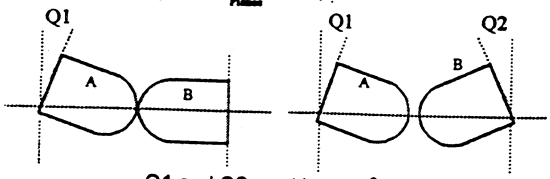


		PASS/FAIL
Distance to A Plane (PA) - inches	0.464	PASS
Distance to B Plane (PB) - inches	0.464	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB

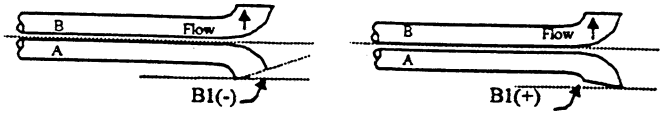


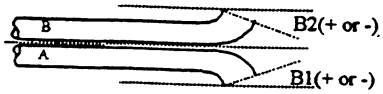
Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



Q1 and Q2 must be ≤ 10°

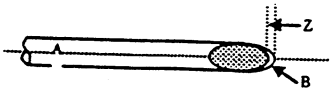
Angle of Q1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	1	PASS



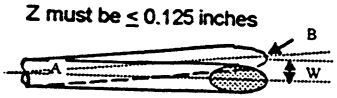


B1 or B2 must be ≤ 5°

Angle of B1 from vertical A Tube- degrees (absolute)	2	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	2	PASS

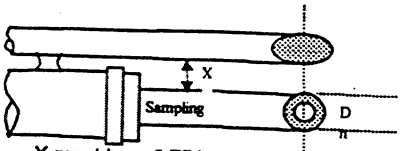


Z must be ≤ 0.125 inches



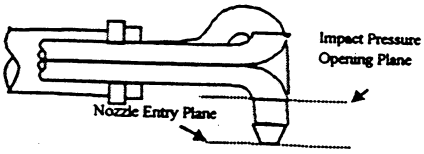
W must be ≤ 0.03125 inches

Horizontal offset between A and B Tubes (Z) - inches	0.018	PASS
Vertical offset between A and B Tubes (W) - inches	0.01	PASS

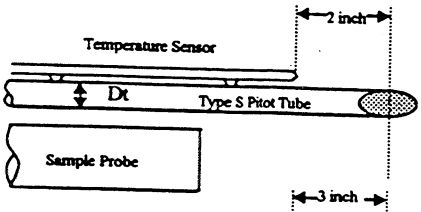


X must be ≥ 0.75 inches

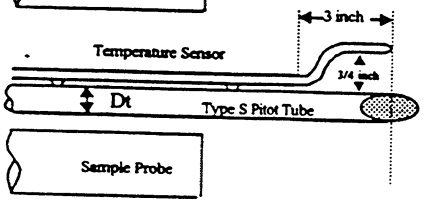
Distance between Sample Nozzle and Pitot (X) - inches: NA



Impact Pressure Opening Plane is above the Nozzle Entry Plane: ◉ YES ○ NO ○ NA — PASS



Thermocouple meets the Distance Criteria in the adjacent figure: ○ YES ○ NO ◉ NA



Thermocouple meets the Distance Criteria in the adjacent figure: ◉ YES ○ NO ○ NA — PASS

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S Type Pitot Tube Inspection Data Form

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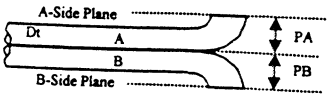
Standard Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P139**

Inspection Date 12/29/99 Individual Conducting Inspection T. Briggs

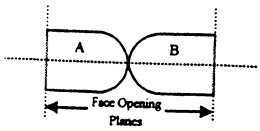
If all Criteria PASS
Cp is equal to 0.84



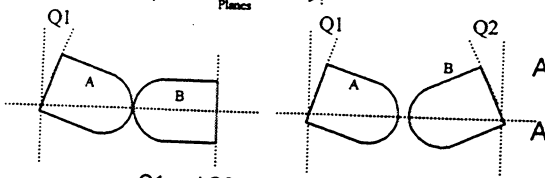
		PASS/FAIL
Distance to A Plane (PA) - inches	0.46	PASS
Distance to B Plane (PB) - inches	0.46	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

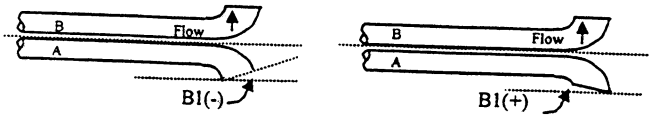


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



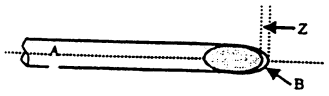
Q1 and Q2 must be ≤ 10°

Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

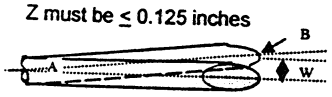


B1 or B2 must be ≤ 5°

Angle of B1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

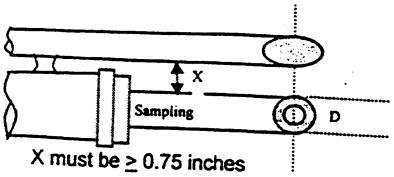


Z must be ≤ 0.125 inches



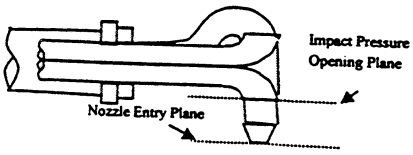
W must be ≤ 0.03125 inches

Horizontal offset between A and B Tubes (Z) - inches	0	PASS
Vertical offset between A and B Tubes (W) - inches	0	PASS

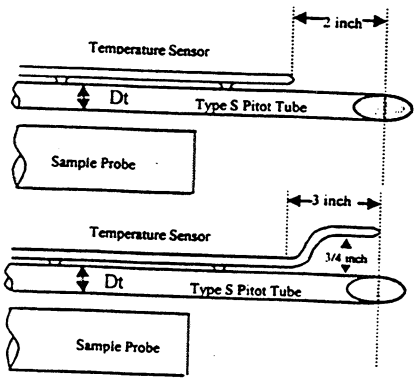


X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches: NA



Impact Pressure Opening Plane is above the Nozzle Entry Plane: (●) YES ( ) NO ( ) NA — PASS



Thermocouple meets the Distance Criteria in the adjacent figure: ( ) YES ( ) NO (●) NA

Thermocouple meets the Distance Criteria in the adjacent figure: (●) YES ( ) NO ( ) NA — PASS

WESTON

P139 12-29-99

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WESTON
MANAGERS DESIGNERS/CONSULTANTS

PITOT TUBE IDENTIFICATION NUMBER: P110

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 1° (<10) α_2 = 1° (<10)

β_1 = 0° (<5) β_2 = 0° (<5)

γ = 1° θ = 2° A = .75 in.

z = A sin γ = .02 in.; (< 1/8 in.),

w = A sin θ = .03 in.; (< 1/32 in.),

P_a = .475 in. P_b = .475 in.

D_t = .24 in. $P_a = P_b$? ✓ (YES) ____ (NO)

COMMENTS ____

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

INSPECTOR Tom Burke DATE 12-22-94

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WESTON

PITOT TUBE IDENTIFICATION NUMBER: P-138

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 0° (< 10°) α_2 = 0° (< 10°)

β_1 = 0° (< 5°) β_2 = 0° (< 5°)

γ = 1° θ = 0° A = .95 in.

.01 in. (< 1/8 in.)

w = A sin θ = 0 in. (< 1/32 in.)

P_a = .465 in. P_b = .465 in.

D_t = .38 in. $P_a = P_b$? ✓ (YES) ____ (NO)

COMMENTS ____

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

T. BRIGGS DATE 12-22-98

WESTON

PITOT TUBE IDENTIFICATION NUMBER: P-301

TYPE S PITOT TUBE INSPECTION DATA FORM

PITOT TUBE ASSEMBLY LEVEL? ✓ (YES) ____ (NO)

PITOT TUBE OPENINGS DAMAGED? ____ (YES-EXPLAIN BELOW) ✓ (NO)

α_1 = 0° (<10) α_2 = 0° (<10)

β_1 = 0 (<5) β_2 = 0° (<5)

γ = 1° θ = 0 A = .93 in.

D_t = .01 in. (< .8 in.)

$w = A \sin\theta$ = 0 in. (< 1/32 in.)

D_1 = .465 in D_2 = .465 in

D_3 = .38 in $P_a = P_b$? ____ (YES) ____ (NO)

COMMENTS 17 inch head

CALIBRATION REQUIRED? ____ (YES) ✓ (NO)

[signature] DATE 2-10-99

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NOZZLE CALIBRATION DATA FORM

Date 3/20/00 – 3/28/00 Calibrated by JMO

	Nozzle Identification Number	Nozzle Diameter, Inches[1]				
		D_1	D_2	D_3	ΔD,[2]	D_{avg}[3]
U3	OHM Inlet R1	.308	.307	.307	.001	.307
	OHM Outlet R1	.273	.275	.274	.002	.273
U3	OHM Inlet R2	.315	.314	.315	.001	.315
U2	OHM Inlet	.275	.273	.275	.002	.275
U2	OHM Outlet	~~.280~~ .270	~~.279~~ .270	~~.280~~ .271	.001	~~.280~~ .270
U4	Inlet	.211	.212	.212	.001	.212
U4	~~Outlet~~ Inlet	.195	.195	.196	.001	.196
U4	Outlet R1	.327	.326	.328	.002	.328
U4	Outlet R2	.302	.302	.302	—	.302

Where:

[1] $D_{1,2,3}$ = Three different nozzle diameters, inches; each diameter must be measured to nearest 0.001 in.

[2] ΔD = Maximum difference between any two diameters, inches. ΔD must be $\leq$0.004 in.

[3] D_{avg} = Nozzle diameter = average of D_1, D_2, and D_3.

nozzle.frm