

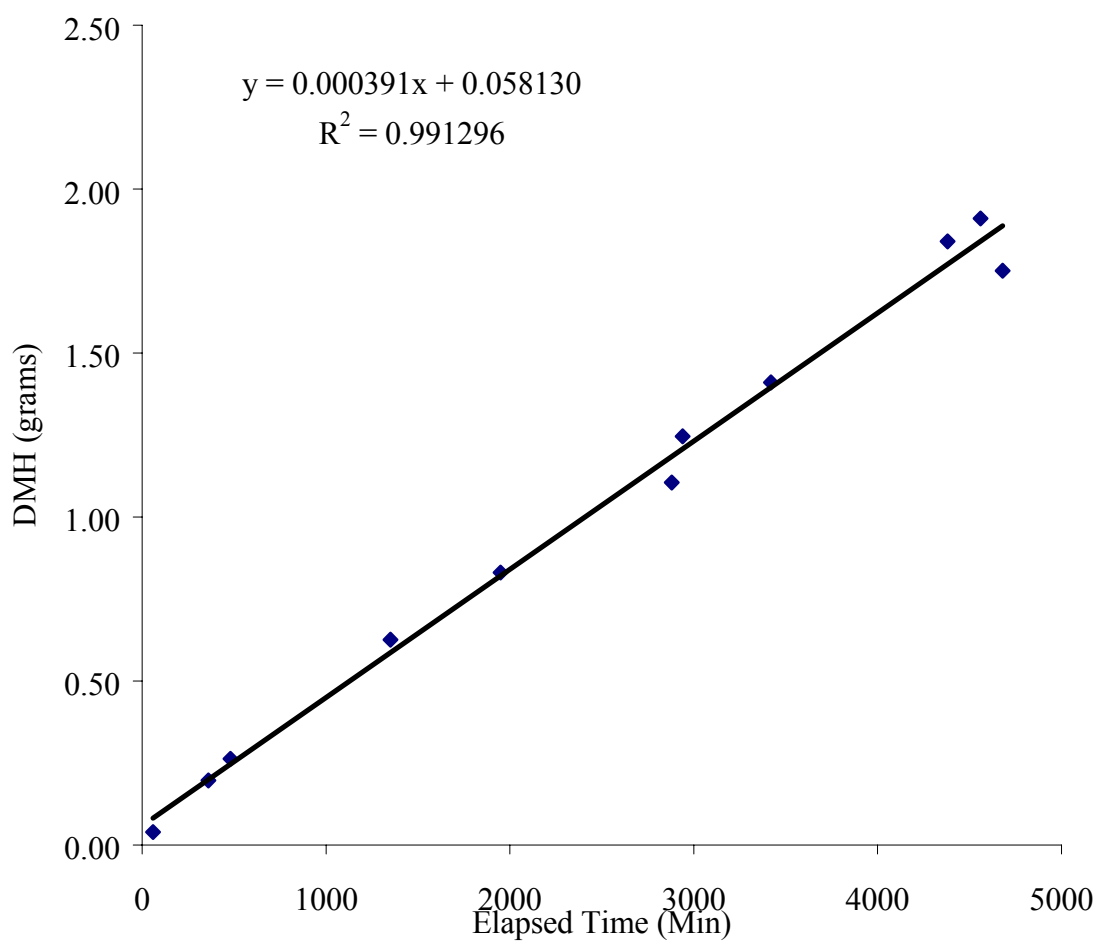
APPENDIX E

Continuous System 5: Synthetic Bangladesh Groundwater Contaminated with Fe (II) and As (V)

HPLC Data Compilation.....	119
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Continuous System 5: HPLC Data									
Time	Elapsed Time	Peak Area	Conc. (M)	Avg. Conc. (M)	S	Summary			
						Conc. (M)	Conc. (M)	Elapsed Time	grams appear
2/10/03 9:00 AM	0	240.73285	1.44E-04	1.44E-04	7.2E-07	1.44E-04	0.144	0	0.00
	0	238.72639	1.43E-04			1.21E-04	0.121	60	0.04
2/10/03 10:00 AM	60	194.15797	1.21E-04	1.21E-04		1.02E-04	0.102	360	0.20
2/10/03 3:00 PM	360	155.94585	1.02E-04	1.02E-04	3.8E-08	1.02E-05	0.086	480	0.26
	480	155.83936	1.01E-04			8.62E-05	0.0792	1350	0.63
2/10/03 5:00 PM	480	155.8605	1.02E-04	1.02E-04	3.3E-07	1.02E-04	0.0792	1950	0.83
	1350	156.7838	1.02E-04			7.13E-05	0.0713	2880	1.11
2/11/03 7:30 AM	1350	125.645	8.62E-05	8.62E-05	5.4E-08	8.62E-05	0.0788	2940	1.25
	1950	125.49322	8.62E-05			7.66E-05	0.0766	3420	1.41
2/11/03 5:30 PM	1950	111.70637	7.92E-05	7.92E-05	3.3E-08	7.92E-05	0.0781	4380	1.84
	2880	111.61329	7.91E-05			7.79E-05	0.0779	4560	1.91
2/12/03 9:00 AM	2880	96.12634	7.13E-05	7.13E-05	3.7E-08	7.13E-05	0.0695	4680	1.75
	2940	96.23005	7.14E-05			7.88E-05	0.0788		
2/12/03 10:00 AM	2940	111.28603	7.90E-05	7.88E-05	2.7E-07	7.90E-05	0.0790		
	3420	110.51997	7.86E-05			7.66E-05	0.0766		
2/12/03 6:00 PM	3420	107.39798	7.70E-05	7.63E-05	5.4E-07	7.70E-05	0.0770		
	4380	105.89326	7.63E-05			7.81E-05	0.0781		
2/13/03 10:00 AM	4380	105.32419	7.60E-05	7.60E-05	3.0E-06	7.60E-05	0.0760		
	4560	113.7991	8.02E-05			8.02E-05	0.0802		
2/13/03 1:00 PM	4560	111.26651	7.90E-05	7.90E-05	1.6E-06	7.90E-05	0.0790		
	4680	106.90323	7.68E-05			7.68E-05	0.0768		
2/13/03 3:00 PM	4680	93.90823	7.02E-05	6.95E-05	9.3E-07	7.02E-05	0.0702		
		91.30879	6.89E-05			6.89E-05	0.0689		

Continuous System 5: Appearance of DMH 5



Continuous System 5: Chemiluminescence Data		
Continuous System 5:	Conc. (mM)	grams BCDMH
0	0.0808	4.260
60	0.0595	4.224
360	0.0415	4.109
480	0.0426	4.053
1350	0.0203	3.982
1950	0.0108	4.047
2880	0.0108	3.944
2940	0.0263	3.476
3300	0.0264	3.376
3420	0.0299	3.224
4560	0.0634	1.329
4680	0.0421	2.263

Turner Designs: TD-20/20 Luminometer Ver. 2020-1E 1098	
Delay Time: (sec)	2
Integrate Time: (sec)	4
Number of Replicates:	1
Sensitivity Level %:	1
Standard Reading:	1.76
Injection Volume #1: (ul)	50
Injection Volume #2: (ul)	50
Average Blank:	89.58
Mode:	STD

The following tables contain the continuous stream data. Each column represents a series of luminescence readings, taken every 0.2 seconds. Five series of measurements (5 columns) were taken from each sample. The first number in the columns represents the blank sample that was obtained prior to the addition of the BCDMH briquette. The instrument was programmed to collect measurements for four seconds with a two second delay. The peak maximums, usually seen around 0.6 seconds were averaged. Average peak maximums and BCDMH concentrations are seen below each sample

Continuous System 5 (pg 1 of 6)										
89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
6589	6532	6447	7048	6190	5268	4727	4187	4704	5333	
965.1	888.7	827.8	852.7	934.8	1251	684.4	650.4	647.6	665	
904.7	834.5	778.3	803.3	872.3	1187	631.6	595.9	602.4	614.3	
829.7	767.5	714.6	739.3	799.5	1110	576.1	538.9	549	565.8	
754.2	698.4	649.2	673.4	726.4	1031	519	483.3	494.4	514	
682.9	632.1	586.7	610.4	657.4	956.4	465.3	431.9	443.1	464	
617.2	570.7	528.5	551	593.6	886.7	415.6	384.4	395.5	417	
556.5	513.7	474.6	496.1	535.4	822	370	341.3	351.8	373.6	
500.6	461.8	425.3	445.9	481.5	761.5	328.5	301.6	312.2	333.7	
449.8	414.2	380.4	399.8	432.8	705.3	290.7	265.5	275.9	297.3	
403.5	370.8	339.1	357.5	388.1	653	256	233	243	263.6	
361.2	331.1	301.6	319.2	347.1	604.4	224.8	203.1	212.9	233	
322.3	294.7	267.6	283.8	309.9	559.1	196.3	176.2	185.7	217.5	
287	261.7	236.2	251.6	276.1	516.3	170.5	151.8	160.7	181.6	
254.7	231.6	207.9	222.3	244.7	477	146.9	129.5	138.2	158.6	
225	204	181.9	195.7	216.5	440.6	125.4	109.4	117.9	137.1	
198.1	178.7	158.2	171	190.4	406.1	105.9	91.25	99.13	117.9	
173.3	155.8	136.6	148.9	166.7	374.4	88.24	74.69	82.28	99.94	
151	134.8	117.2	128.4	144.9	344.5	72.23	59.5	66.81	83.93	
130.2	115.6	99.12	109.8	124.9	316.8	57.57	45.91	52.7	68.99	
111.6	98.33	82.88	92.73	107.1	290.7	44.27	33.42	39.93	55.42	
94.59	82.36	68	77.03	90.35	266.6	38.21	28.17	34.31	42.94	
78.88	67.72	54.43	62.94	75.17	244.1	27.27	18.19	24.05	37.79	
64.52	54.15	41.92	49.9	61.34	222.9	17.52	8.846	14.36	27.42	
51.49	42.18	30.74	38.2	48.57	203.1	8.403	0.327	5.545	18.25	
39.52	31	26.06	33.01	36.85	184.6	0.074	-7.403	-2.444	9.566	
34.36	26.52	16.9	23.33	32.24	167.2	-7.52	-14.43	-9.754	1.591	
Samp1 r0	Samp2 r0	Samp3 r0	Samp4 r0	Samp5 r0	Samp6 r0	Samp7 r0	Samp8 r0	Samp9 r0	Samp10 r0	
2/10/2003 9:00					2/10/2003 10:00					
Average Peak Max				6561.2	Average Peak Max				4843.8	
BCDMH Conc. (mM)				0.08084	BCDMH Conc. (mM)				0.05949	

Continuous System 5 (pg 2 of 6)

89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	
0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	
383.6	845.6	717.7	180.2	751.5	142.7	231.1	485.4	1029	80.46		
3485	3449	3255	3412	3374	4658	4414	2622	2780	2948		
586.7	563.4	545.4	567.8	562.4	582.2	593.5	506	521.6	478.8		
527.7	510.1	494.7	503.6	510.9	538	549.2	459.6	473.7	440.5		
471.2	455.2	442.2	449	455.2	491.9	500.4	414.5	428.6	399.8		
418.8	404.2	392.8	398.5	405.3	447.6	452.3	371.3	385.2	359.9		
371	357.4	347.7	352.3	359.6	406.3	407.4	331.1	344.4	322.4		
327.7	314.7	306.6	310.7	318	368.3	365.9	294.1	306.6	287.3		
288.3	276.4	269.3	273.1	280.1	333.2	327.8	260.7	272.1	255.6		
252.9	240.7	235.6	238.8	245.8	300.9	292.8	229.7	240.9	226.2		
220.7	209.4	205	208	214.7	271	260.7	201.7	212.1	199.3		
191.5	181	177.5	180.2	186.7	243.8	231.4	176.2	185.7	174.9		
165.3	155.3	152.6	154.7	161.3	218.6	204.4	152.6	161.8	152.3		
141.3	132.1	129.6	132.1	138	195.2	180	131.6	140.1	131.9		
119.6	111.3	109.3	111.3	116.9	173.7	157.4	112.1	120	112.9		
100.2	92.07	90.69	92.6	98.01	153.9	136.5	94.41	101.7	95.77		
82.35	75.04	73.69	75.58	80.71	135.7	117.5	78.11	85.18	80.01		
66.39	59.35	58.56	59.91	65.05	118.9	100.1	63.43	69.96	65.61		
51.79	45.3	44.76	46.13	50.71	103.1	84.36	50.12	56.1	52.29		
38.57	32.61	32.33	33.43	38.01	88.7	69.7	37.89	43.32	40.35		
32.64	27.1	26.81	27.96	32.22	75.38	56.37	32.66	38	35.39		
22.06	16.91	16.82	17.84	21.82	63.17	43.86	22.7	27.45	25.56		
12.2	7.402	7.457	8.376	12.15	51.74	32.74	13.39	18.08	16.31		
3.291	-1.213	-1.065	-0.226	3.358	41.14	28.48	4.832	9.251	7.81		
-4.852	-9.004	-8.747	-8.017	-4.649	37.49	19.34	-2.934	1.173	0.045		
-12.21	-16.04	-15.77	-15.12	-11.95	28.48	10.64	-10.07	-6.211	-7.109		
-18.92	-22.49	-22.12	-21.52	-18.55	20.41	2.669	-16.57	-12.96	-13.64		
-25	-28.32	-27.94	-27.4	-24.61	12.7	-4.606	-22.54	-19.12	-19.65		
Samp11 r	Samp12 r	Samp13 r	Samp14 r	Samp15 r	Samp16 r	Samp17 r	Samp18 r	Samp19 r	Samp20 r		
2/10/2003 15:00					2/10/2003 17:00						
Average Peak Max				3395	Average Peak Max				3484.4		
BCDMH Conc. (mM)				0.04148	BCDMH Conc. (mM)				0.04259		

Continuous System 5 (pg 3 of 6)

89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
51	183.9	0	188	265.2	39.54	0	0	0	0	37.6
1606	1624	1822	1761	1639	920.3	1084	925.1	932.9	764.6	
481.7	407.5	428.7	432.1	396.8	290.9	315.1	300.1	274.1	258	
434.3	365.9	386.9	391	360.1	264.6	286.4	276.4	250.7	234	
388.6	324.8	343.1	348.3	320.1	236.2	255.9	249.1	224.7	209.3	
345.6	285.7	301.3	307	282.4	208.6	226.4	221.6	198.8	184.8	
306.2	249.8	262.7	269.5	247.6	183.2	199.1	195.3	174	162.1	
270.6	217.3	227.9	235.6	216.2	159.7	174	171.3	151.3	141	
238.1	187.4	196.7	204.7	187.4	138.3	151	149.1	130.5	121.8	
208.5	160.9	168.5	176.7	161.4	118.6	130.2	128.8	111.3	103.7	
182	136.5	143.1	151.6	137.9	100.8	111.3	110.2	93.97	87.49	
157.3	114.6	120.1	128.6	116.5	84.56	93.71	93.46	78.02	72.35	
135.1	95.19	99.57	108.1	97.11	69.68	78.05	77.78	63.7	58.84	
114.9	77.4	80.96	89.16	79.59	55.89	63.44	63.45	50.45	46.14	
96.85	61.25	63.99	72.21	63.71	43.47	50.2	50.47	38.29	34.51	
79.88	46.48	48.95	56.86	49.21	32.1	38.04	38.58	33.14	30.02	
64.55	39.5	34.99	42.92	36.07	27.62	33.03	33.64	23.24	20.58	
50.87	27.5	28.84	36.35	30.44	18.42	22.66	23.86	13.94	11.68	
38	17	17.98	25.17	19.96	9.612	13.4	14.68	5.414	3.521	
32.72	7.211	7.841	14.77	10.14	1.563	4.936	6.221	-2.39	-4	
22.44	-1.637	-1.322	5.293	1.239	-5.783	-2.828	-1.53	-9.559	-10.87	
12.87	-9.678	-9.555	-3.267	-6.856	-12.53	-9.93	-8.631	-16.12	-17.24	
4.102	-16.91	-17.05	-11.03	-14.17	-18.72	-16.45	-15.21	-22.14	-22.99	
-3.897	-23.54	-23.77	-18.12	-20.84	-24.4	-22.43	-21.21	-27.64	-28.35	
-11.23	-29.47	-29.9	-24.51	-26.92	-29.63	-27.91	-26.69	-32.7	-33.26	
-17.87	-34.89	-35.42	-30.31	-32.43	-34.38	-32.9	-31.73	-37.33	-37.76	
-23.91	-39.83	-40.42	-35.61	-37.43	-38.82	-37.51	-36.42	-41.61	-41.88	
-29.51	-44.29	-44.92	-40.4	-42	-42.84	-41.76	-40.69	-45.52	-45.67	
Samp21 r	Samp22 r	Samp23 r	Samp24 r	Samp25 r	Samp27 r	Samp28 r	Samp29 r	Samp30 r	Samp31 r	
2/11/2003 19:30					2/11/2003 17:30					
Average Peak Max				1690.4	Average Peak Max				925.38	
BCDMH Conc. (mM)				0.02028	BCDMH Conc. (mM)				0.01077	

Continuous System 5 (pg 4 of 6)

89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	27.98	11.34	0	95.3	139.3	132	197.9	
999.3	953.4	905.7	966.7	818.8	2305	2160	2061	2195	2148	
304.8	254.4	294.8	277	225	330.4	324.7	316.8	318.1	320.3	
274.7	228.1	268.2	252.1	200	296.7	288.7	280.5	287.1	289	
243.1	203.3	238.4	223.7	175.7	263	256.5	248.2	255.6	259.4	
212.8	179	209.3	195.4	152.8	231.1	225.6	217.9	225.6	230.8	
185	156.7	180.1	168.9	131.6	201.5	196.6	190	197.9	203.7	
159.4	135.9	155	144.6	112.2	174.7	170.3	164.8	172.8	179	
136.5	117.1	132.4	122.8	94.48	150.4	146.5	141.9	149.5	156.6	
115.5	99.68	111.7	102.9	77.85	128.5	124.9	121.3	128.5	135.8	
96.41	83.6	93.13	84.93	63.13	108.2	105.5	101.7	109.3	116.9	
79.24	69.15	76.23	68.59	49.5	89.92	87.72	84.42	91.8	99.74	
63.7	56.06	60.69	53.86	36.96	73.5	71.58	68.83	75.93	83.86	
49.52	43.78	46.78	40.23	31.8	58.73	56.81	54.61	61.18	69.38	
36.7	38.62	33.97	34.05	21.73	45.05	43.39	41.77	48.05	56.24	
31.09	28.4	28.7	23.26	12.29	38.74		36.17	35.73	43.93	
20.76	19.27	18.5	13.18	3.681	28.13	26.73	25.73	30.91	39	
11.1	10.66	8.984	3.968	-4.191	17.63	16.65	15.99	21.07	28.78	
2.298	2.735	0.292	-4.341	-11.38	8.316	7.467	7.02	11.84	19.7	
-5.712	-4.565	-7.608	-11.91	-17.93	-0.172	-0.843	-1.112	3.365	11.06	
-13	-11.25	-14.81	-18.8	-23.96	-7.867	-8.483	-8.545	-4.397	3.137	
-19.64	-17.42	-21.38	-25.08	-29.49	-14.9	-15.44	-15.36	-11.46	-4.104	
-25.72	-23.07	-27.33	-30.8	-34.49	-21.33	-21.75	-21.56	-17.94	-10.81	
-31.23	-28.27	-32.74	-35.98	-39.11	-27.16	-27.51	-27.25	-23.86	-16.98	
-36.28	-33.04	-37.71	-40.72	-43.32	-32.51	-32.8	-32.45	-29.3	-22.64	
-40.86	-37.46	-42.23	-45.01	-47.18	-37.37	-37.62	-37.16	-34.28	-27.84	
-45.06	-41.52	-46.35	-48.93	-50.73	-41.82	-42.03	-41.52	-38.85	-32.64	
-48.89	-45.24	-50.11	-52.53	-53.98	-45.87	-46.04	-45.52	-43	-37.05	
Samp32 r	Samp33 r	Samp34 r	Samp35 r	Samp36 r	Samp37 r	Samp38 r	Samp39 r	Samp40 r	Samp41 r	
2/12/2003 9:00					2/12/2003 10:00					
Average Peak Max			928.78		Average Peak Max			2173.8		
BCDMH Conc. (mM)			0.01081		BCDMH Conc. (mM)			0.02629		

Continuous System 5 (pg 5 of 6)

89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
131.7	206.6	383.5	0	240.5	432.2	0	0	0	335.4	
2404	2208	2114	2224	1971	2195	2453	2521	2740	2404	
328.9	329.8	321.7	306.1	283.5	396.7	351.4	314.8	411.9	342.6	
294.2	295.9	274	255.7	250.5	349.5	308	280.2	371.7	303.6	
260.4	261.7	240.9	226.2	220.2	309.9	270.9	244.8	329.2	267.6	
228.4	229	210.4	198.6	191.5	272.9	236.9	211.3	288.5	234.4	
199.5	199.2	182.5	173.5	165.3	239.9	205.8	180.8	251.7	204.5	
173.3	172.4	157.1	150.6	141.5	210	177.8	153.4	218.5	177	
149.2	148.1	134.4	129.3	120	183	152.5	128.6	188.5	152.5	
127.6	126	113.7	110.1	100.3	158.6	129.7	106.4	161.9	130.3	
108	106.3	94.83	92.95	82.54	136.6	109.1	86.59	137.4	110.2	
90.21	88.01	77.9	77.09	66.69	116.5	90.44	68.73	115.4	91.8	
74.09	71.9	62.61	62.62	51.96	98.4	73.68	52.51	95.9	75.05	
59.35	56.88	48.66	49.5	38.83	81.93	58.56	38.22	77.8	60.2	
45.41	43.49	35.84	37.48	32.97	66.83	44.81	31.38	61.85	46.46	
38.3	37.15	30.49	32.65	22.43	53.35	38.46	19.99	47.29	40.08	
27.94	26.3	20.27	23.03	12.5	40.99	27.42	9.427	40.15	28.76	
17.6	16.15	10.69	13.96	3.495	35.75	17.11	-0.048	28.17	18.79	
8.439	6.935	2.032	5.705	-4.694	25.72	7.763	-8.602	17.61	9.4	
0.14	-1.528	-5.897	-1.828	-12.12	16.25	-0.749	-16.33	7.805	0.86	
-7.489	-9.198	-13.14	-8.733	-18.91	7.598	-8.492	-23.25	-1.107	-6.965	
-14.42	-16.24	-19.75	-14.99	-25.08	-0.337	-15.55	-29.57	-9.18	-14.08	
-20.72	-22.57	-25.77	-20.79	-30.71	-7.557	-21.96	-35.24	-16.51	-20.58	
-26.55	-28.38	-31.28	-26.04	-35.84	-14.2	-27.77	-40.4	-23.18	-26.49	
-31.84	-33.7	-36.3	-30.9	-40.48	-20.28	-33.12	-45.03	-29.2	-31.93	
-36.71	-38.54	-40.83	-35.32	-44.76	-25.83	-37.98	-49.24	-34.69	-36.89	
-41.11	-42.97	-45.04	-39.36	-48.66	-30.94	-42.39	-53.02	-39.68	-41.4	
-45.17	-47.03	-48.84	-43.09	-52.21	-35.6	-46.43	-56.47	-44.18	-45.53	
Samp42 r	Samp43 r	Samp44 r	Samp45 r	Samp46 r	Samp105	Samp106	Samp107	Samp108	Samp109	
2/12/2003 16:00					12 feb 03 6:00 pm					
Average Peak Max				2184.2	Average Peak Max				2462.6	
BCDMH Conc. (mM)				0.02642	BCDMH Conc. (mM)				0.02988	

Continuous System 5 (pg 6 of 6)

89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58	89.58
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	616.1	1123	823.4	130.3	0	221.4	126.7	67.17
6651	6869	4651	3429	4182	3361	3813	3024	2848	4169
283.2	247.4	331.5	298.1	290.1	184.7	206.2	169.5	211.5	176.3
246.3	216.7	249	236.5	251.3	150.8	165.5	140.2	137.5	148.1
214.7	189.4	217.6	207.5	221.8	125.1	138.7	115.3	111.2	122.9
187.9	165.4	190.6	182.4	195.3	101.8	115.1	93.62	89.55	100.1
164.1	143.8	166.8	159.9	171.7	81.4	93.89	74.31	70.81	80.32
143	124.4	145.2	139.4	150.4	63.46	74.87	57.2	54.22	62.66
123.8	107.1	125.7	121	131.2	47.42	58.02	41.98	39.29	46.62
106.8	91.22	107.9	104.3	113.4	33.03	42.8	34.22	32.34	38.42
91.51	76.71	91.76	89.02	97.51	26.67	35.26	22.25	20.84	25.97
77.54	63.55	77.26	75.05	82.72	15.06	23.42	11.26	10.23	14.6
64.66	51.5	63.55	62.18	69.3	4.713	12.52	1.462	0.75	4.328
53.16	40.29	51.23	50.67	56.97	-4.509	2.7	-7.365	-7.779	-4.868
42.76	36.16	39.99	39.72	45.47	-12.82	-6.128	-15.32	-15.52	-13.13
39.04	27.12	35.84	35.88	35.07	-20.31	-14.07	-22.48	-22.47	-20.55
30.19	18.48	26.64	27.05	31.46	-27.01	-21.21	-28.91	-28.73	-27.25
22.36	10.57	17.93	18.58	22.84	-33.09	-27.67	-34.69	-28.95	-33.24
14.87	3.248	9.833	10.82	14.63	-29.16	-33.52	-2.396	0	-30.9
7.964	-3.538	2.417	3.61	7.064	0	-38.77	0	0	0
1.576	-9.707	-4.396	-2.998	0.032	0	-33.34	0	0	0
-4.36	-15.45	-10.67	-9.139	-6.452	0	0	0	0	0
-9.83	-20.8	-16.5	-14.84	-12.43	0	0	0	0	0
-14.88	-25.72	-21.86	-20.1	-17.95	0	0	0	0	0
-19.58	-30.27	-26.82	-24.98	-23.11	0	0	0	0	0
-23.96	-34.51	-31.41	-29.45	-27.86	0	0	0	0	0
-28.01	-38.41	-35.64	-33.68	-32.24	0	0	0	0	0
-31.82	-42.07	-39.57	-37.54	-36.33	0	0	0	0	0
Samp116	Samp117	Samp118	Samp119	Samp120	Samp121	Samp122	Samp123	Samp124	Samp125
13 feb 03 1:00 pm					13 feb 03 3:00 pm				
Average Peak Max				5156.4	Average Peak Max				3443
BCDMH Conc. (mM)				0.06338	BCDMH Conc. (mM)				0.04207

Continuous System 5: Decomposition of 4.26 gram BCDMH Briquette

