Appendix A

Sampling and Analysis Precision

Appendix A

Sampling and Analysis Precision

To calculate mass removal rates of volatile organic compounds (VOCs) and to monitor effectiveness of the vapor vacuum extraction with treatment (VVET) system at the Subsurface Disposal Area, vapor samples were collected from monitoring wells and at the inlet of the VVET units then analyzed using a Brüel and Kjær photoacoustic, multigas analyzer. Tables A-1 and A-2 show the precision of duplicate or repeat samples of chloroform, 1,1,1-trichloroethane, tetrachloroethene, trichloroethene, CCl_4, and total VOCs for the end-year 2003 operational period.

Table A-1. Sample duplicates during operational period end-year 2003.

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
1	7/7/03 10:26 AM	Normal	1.55	1.42	0.349	0.299	0.808	14400
	7/7/03 10:29 AM	Duplicate	1.29	1.3	0.319	0.233	0.679	15300
RPD			18.31%	8.8%	9.0%	24.81%	17.4%	6.06%
2	7/7/03 11:26 AM	Normal	3.65	4.17	1.29	2.99	4.87	15100
	7/7/03 11:29 AM	Duplicate	3.63	4.09	0.975	2.77	5.28	14000
RPD			0.55%	1.94%	27.8%	7.64%	8.08%	7.56%
3	7/7/03 11:41 AM	Normal	2.87	3.58	0.751	1.8	5.53	12900
	7/7/03 11:47 AM	Duplicate	2.84	3.53	0.709	1.66	5.43	12700
RPD			1.05%	1.41%	5.75%	8.1%	1.82%	1.56%
4	7/8/03 9:12 AM	Normal	2.2	2.32	1.00	1.27	4.75	17300
	7/8/03 9:15 AM	Duplicate	2.13	2.27	0.871	0.846	2.86	16500
RPD			3.2%	2.18%	13.8%	40.1%	49.7%	4.73%
5	7/8/03 10:06 AM	Normal	5.13	2.83	2.21	6.56	13.9	18900
	7/8/03 10:09 AM	Duplicate	3.97	2.29	1.64	5.24	9.96	19100
RPD			25.5%	21.1%	29.6%	22.4%	33.0%	1.05%
6	7/8/03 12:24 PM	Normal	8.26	4.92	2.04	8.25	22.7	13500
	7/8/03 12:27 PM	Duplicate	9.13	5.00	2.07	9.44	23.8	14000
RPD			10.0%	1.6%	1.46%	13.5%	4.73%	3.64%
7	7/8/03 1:18 PM	Normal	8.57	6.11	2.08	9.62	22.0	13400
	7/8/03 1:21 PM	Duplicate	10.0	10.9	3.58	18.2	32.2	13300
RPD			15.4%	56.3%	53.0%	61.7%	37.6%	0.75%
8	7/8/03 2:36 PM	Normal	215	69.0	7.89	199	929	14000
	7/8/03 2:39 PM	Duplicate	294	88.2	11.1	277	1230	14100
RPD			31.04%	24.4%	33.8%	32.77%	27.9%	0.71%
9	8/4/03 12:35 PM	Normal	4.37	3.21	0.685	1.49	7.03	21200
	8/4/03 12:38 PM	Duplicate	4.77	3.48	0.716	1.4	7.88	21000
RPD			8.75%	8.07%	4.43%	6.2%	11.4%	0.95%

Table A-1. (continued).

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
10	8/4/03 3:14 PM	Normal	2.94	1.42	0.267	0.878	1.16	19500
	8/4/03 3:17 PM	Duplicate	2.72	1.23	0.207	0.686	1.04	19500
RPD			7.77%	14.3%	25.3%	24.6%	10.9%	0.00%
11	8/4/03	Normal	9.1	3.89	3.05	11.5	23.0	21900
	8/4/03	Duplicate	7.57	2.99	2.35	9.23	17.6	22000
RPD			18.4%	26.2%	25.9%	21.9%	26.6%	0.46%
12	8/4/03	Normal	4.97	3.59	1.15	3.31	5.2	19500
	8/4/03	Duplicate	4.50	3.35	0.717	2.51	4.55	19300
RPD			9.93%	6.9%	46.4%	27.5%	13.3%	1.03%
13	8/4/03	Normal	4.09	3.24	0.61	1.7	5.01	19200
	8/4/03	Duplicate	3.87	3.23	0.541	1.71	5.2	19200
RPD			5.53%	0.31%	12%	0.59%	3.7%	0.00%
14	8/5/03 9:56 AM	Normal	9.00	4.95	2.39	8.98	27.1	25900
	8/5/03 9:59 AM	Duplicate	4.12	2.01	1.54	4.92	10.6	27200
RPD			74.4%	84.5%	43.3%	58.4%	87.5%	4.90%
15	8/5/03 12:29 PM	Normal	9.50	10.1	2.41	15.0	31.2	17100
	8/5/03 12:32 PM	Duplicate	9.96	10.5	2.90	17.3	32.0	16700
RPD			4.73%	3.9%	18.5%	14.2%	2.53%	2.37%
16	8/6/2003 11:27 AM	Normal	183	55.5	6.62	144	693	20300
	8/6/03 11:33 AM	Duplicate	44.3	9.45	2.01	44.4	103	19500
RPD			122%	141.8%	107%	106%	148%	4.02%
17	9/2/03	Normal	1.81	1.29	0.525	0.461	1.32	17800
	9/2/03	Duplicate	1.79	1.15	0.504	0.412	1.24	18800
RPD			1.11%	11.5%	4.08%	11.2%	6.25%	5.46%
18	9/2/03	Normal	3.56	2.17	0.75	1.53	3.44	17800
	9/2/03	Duplicate	3.28	1.89	0.397	1.50	3.30	17900
RPD			8.19%	13.8%	61.6%	1.98%	4.15%	0.56%
19	9/2/03	Normal	3.09	1.65	0.218	0.481	0.774	18300
	9/2/03	Duplicate	2.54	1.33	0.192	0.399	0.691	16000
RPD			19.5%	21.5%	12.7%	18.6%	11.3%	13.41%

Table A-1. (continued).

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
20	9/2/03	Normal	3.53	3.28	0.653	1.58	4.80	16000
	9/2/03	Duplicate	3.46	3.25	0.611	1.47	4.91	15600
RPD			2.00%	0.92%	6.65%	7.21%	2.27%	2.53%
21	9/2/03	Normal	2.21	1.20	0.232	0.522	0.736	15700
	9/2/03	Duplicate	2.47	1.02	0.211	0.391	0.294	16600
RPD			11.1%	16.2%	9.48%	28.7%	85.8%	5.57%
22	9/3/03 10:10 AM	Normal	8.11	5.86	1.82	11.7	18.2	14500
	9/3/03 10:13 AM	Duplicate	8.36	5.97	2.18	12.4	16.5	14400
RPD			3.04%	1.86%	18.0%	5.81%	9.80%	0.69%
23	9/3/03 10:28 AM	Normal	28.5	15.8	3.47	28.4	106	14600
	9/3/03 10:31 AM	Duplicate	28.7	15.8	3.49	28.7	107	14600
RPD			0.70%	0.00%	0.57%	1.05%	0.94%	0.00%
24	9/3/03 10:37 AM	Normal	5.44	2.94	1.12	4.79	10.4	14600
	9/3/03 10:40 AM	Duplicate	5.94	2.70	1.04	4.29	9.13	14500
RPD			8.79%	8.51%	7.41%	11.0%	13.0%	0.69%
25	9/3/03 12:28 PM	Normal	25.3	5.26	0.843	18.5	43.1	15100
	9/3/03 12:31 PM	Duplicate	17.6	3.94	0.723	12.5	25.8	15100
RPD			35.9%	28.7%	15.3%	38.7%	50.2%	0.00%
26	9/4/03 9:05 AM	Normal	4.33	3.62	1.89	2.46	10.5	12600
	9/4/03 9:08 AM	Duplicate	4.82	4.04	1.62	2.30	11.2	12400
RPD			10.7%	11.0%	15.4%	6.72%	6.45%	1.60%
27	9/4/03 10:35 AM	Normal	7.01	5.24	4.85	11.7	30.2	12400
	9/4/03 10:38 AM	Duplicate	4.68	3.15	3.21	6.72	14.9	12400
RPD			39.9%	49.8%	40.7%	54.1%	67.8%	0.00%
28	10/7/03 10:39 AM	Normal	2.05	2.13	3.45	1.95	4.05	20900
	10/7/03 10:42 AM	Duplicate	1.21	1.73	2.49	1.44	2.57	16200
RPD			51.5%	20.7%	32.3%	30.1%	44.7%	25.34%

Table A-1. (continued).

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
29	10/7/03 11:00 AM	Normal	2.28	3.11	1.21	1.76	5.70	14000
	10/7/03 11:03 AM	Duplicate	1.95	2.62	1.16	1.62	5.59	13900
RPD			15.60%	17.1%	4.2%	8.28%	1.95%	0.72%
30	10/7/03 11:51 AM	Normal	3.08	2.42	0.825	2.27	4.93	15100
	10/7/03 11:54 AM	Duplicate	3.19	2.79	0.753	2.41	5.08	14700
RPD			3.51%	14.2%	9.13%	5.98%	3.00%	2.68%
31	10/7/03 2:50 PM	Normal	7.72	6.49	1.59	7.69	31.5	12900
	10/7/03 2:53 PM	Duplicate	4.69	3.76	1.08	4.65	17.1	12900
RPD			48.8%	53.3%	38.2%	49.3%	59.3%	0.00%
32	10/8/03 1:08 PM	Normal	3.42	1.43	0.672	4.27	9.75	14600
	10/8/03 1:11 PM	Duplicate	3.02	1.43	0.637	3.35	7.52	14400
RPD			12.4%	0.00%	5.35%	24.1%	25.8%	1.38%
33	10/8/03 1:47 PM	Normal	9.4	5.21	1.79	13.8	31.0	13700
	10/8/03 1:50 PM	Duplicate	9.46	6.19	2.01	12.6	34.1	13600
RPD			0.64%	17.2%	11.6%	9.09%	9.52%	0.73%
34	10/9/03 10:52 AM	Normal	11.9	7.74	4.51	14.2	43.1	11600
	10/9/03 10:55 AM	Duplicate	15.6	9.25	4.84	18.1	52.7	11600
RPD			26.9%	17.8%	7.06%	24.1%	20.0%	0.00%
35	11/3/03 1:45 PM	Normal	1.83	2.69	1.13	1.71	5.47	9710
	11/3/03 1:48 PM	Duplicate	1.71	2.69	1.08	1.63	5.47	9550
RPD			6.78%	0.00%	4.52%	4.79%	0.00%	1.66%
36	11/3/03 2:00 PM	Normal	0.844	0.709	0.555	0.479	0.891	9730
	11/3/03 2:03 PM	Duplicate	0.817	0.682	0.429	0.381	0.738	9880
RPD			3.25%	3.88%	25.6%	22.8%	18.8%	1.53%
37	11/3/03 2:21 PM	Normal	1.19	0.923	0.336	0.56	1.41	9430
	11/3/03 2:24 PM	Duplicate	1.10	0.927	0.315	0.582	1.33	9380
RPD			7.86%	0.43%	6.45%	3.9%	5.84%	0.53%

Table A-1. (continued).

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
38	11/3/03 2:39 PM	Normal	2.21	1.35	0.408	1.69	4.28	8880
	11/3/03 2:42 PM	Duplicate	2.47	1.31	0.363	1.63	4.06	8800
RPD			11.1%	3.01%	11.7%	3.61%	5.28%	0.90%
39	11/4/03 10:13 AM	Normal	1.30	0.90	0.971	1.87	3.18	6220
	11/4/03 10:16 AM	Duplicate	1.55	1.01	1.04	2.15	4.05	6200
RPD			17.5%	12%	6.86%	13.9%	24.1%	0.32%
40	11/4/03 10:31 AM	Normal	6.13	4.21	2.10	8.44	28.6	6330
	11/4/03 10:34 AM	Duplicate	12.2	7.37	2.78	12.6	50.6	6290
RPD			66.2%	54.6%	27.9%	39.5%	55.6%	0.63%
41	11/4/03 12:25 PM	Normal	5.96	4.95	1.40	7.16	18.9	6550
	11/4/03 12:28 PM	Duplicate	6.06	4.46	1.47	7.22	19.1	6570
RPD			1.66%	10.4%	4.88%	0.83%	1.05%	0.30%
42	11/4/03 2:52 PM	Normal	19.4	7.38	1.22	34.4	95.8	6410
	11/4/03 2:55 PM	Duplicate	25.0	9.60	1.42	43.0	130	6300
RPD			25.2%	26.1%	15.2%	22.2%	30.3%	1.73%
43	12/1/03 3:57 PM	Normal	4.02	1.70	1.14	6.47	17.8	11700
	12/1/03 4:00 PM	Duplicate	3.14	1.26	1.01	5.26	12.6	11700
RPD			24.6%	29.7%	12.1%	20.6%	34.2%	0.00%
44	12/2/03 10:18 AM	Normal	4.05	2.78	4.34	7.26	15.8	7360
	12/2/03 10:21 AM	Duplicate	2.98	2.06	3.08	4.91	8.73	7540
RPD			30.4%	29.8%	34.0%	38.6%	57.6%	2.42%
45	12/2/03 12:46 PM	Normal	11.1	6.25	1.94	12.4	46.0	8250
	12/2/03 12:49 PM	Duplicate	7.33	4.24	1.48	9.17	37.0	8250
RPD			40.9%	38.3%	26.9%	29.95%	21.7%	0.00%
46	12/2/03 1:52 PM	Normal	760	209	33.1	433	3040	9470
	12/2/03 1:58 PM	Duplicate	834	228	38.9	523	3430	9680
RPD			9.28%	8.7%	16.1%	18.83%	12.06%	2.19%

Table A-1. (continued).

	Date and Time		$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
47	12/2/03 2:22 PM	Normal	8.12	5.35	1.44	11.1	30.6	9150
	12/2/03 2:25 PM	Duplicate	7.83	5.41	1.66	11.1	26.4	8970
RPD			3.64%	1.1%	14.2%	0.00%	14.74%	1.99%
48	12/3/03 3:12 PM	Normal	2.02	2.33	1.4	1.36	4.03	11500
	12/3/03 3:15 PM	Duplicate	2.09	2.37	1.07	1.42	4.71	11400
RPD			3.41%	1.7%	26.7%	4.32%	15.56%	0.87%
49	12/3/03 3:36 PM	Normal	1.30	0.776	0.455	0.862	1.57	11200
	12/3/03 3:39 PM	Duplicate	1.30	0.745	0.452	0.718	1.56	11200
RPD			0.00%	4.08%	0.66%	18.2%	0.64%	0.00%
50	12/4/03 11:21 AM	Normal	2.62	1.34	0.679	1.45	3.53	7190
	12/4/03 11:24 AM	Duplicate	2.64	1.36	0.374	1.41	3.73	7230
RPD			0.76%	1.48%	57.9%	2.80%	5.51%	0.55%
51	12/4/03 11:51 AM	Normal	1.45	1.05	0.225	0.399	1.14	7310
	12/4/03 11:54 AM	Duplicate	1.24	0.904	0.239	0.314	0.935	7320
RPD			15.6%	14.9%	6.03%	23.8%	19.8%	0.14%
52	12/4/03 12:06 PM	Normal	1.33	0.806	0.203	0.461	1.18	7320
	12/4/03 12:09 PM	Duplicate	1.40	0.739	0.18	0.521	1.13	7330
RPD			5.13%	8.67%	12%	12.2%	4.33%	0.14%

CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
PCE = tetrachloroethylene
TCA = trichloroethane
TCE = trichloroethylene
RPD = relative percent difference

Table A-2. Sample repeats during operational period end-year 2003.

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
1	7/7/03 10:35 AM	Normal	1.27	1.19	0.34	0.238	0.535	14100
	7/7/03 10:38 AM	Repeat	1.35	1.35	0.247	0.202	0.476	13900
RPD			6.11%	12.6%	32%	16.4%	11.7%	1.43%
2	7/7/03 11:08 AM	Normal	1.61	1.49	0.291	0.439	0.792	14600
	7/7/03 11:11 AM	Repeat	1.55	1.56	0.258	0.565	0.73	14400
RPD			3.80%	4.59%	12.0%	25.1%	8.1%	1.38%
3	7/7/03 11:41 AM	Normal	2.87	3.58	0.751	1.8	5.53	12900
	7/7/03 11:44 AM	Repeat	2.9	3.59	0.744	1.72	5.38	12800
RPD			1.0%	0.28%	0.94%	4.5%	2.75%	0.78%
4	7/8/03 9:36 AM	Normal	99.2	28.4	5.91	113	362	18000
	7/8/03 9:39 AM	Repeat	99.4	28.5	6.01	114	365	17900
RPD			0.20%	0.35%	1.68%	0.88%	0.83%	0.56%
5	7/8/03 10:12 AM	Normal	4.02	2.27	1.46	4.84	9.05	19000
	7/8/03 10:15 AM	Repeat	4.12	2.37	1.39	4.82	8.76	18800
RPD			2.46%	4.31%	4.91%	0.41%	3.26%	1.06%
6	7/8/03 10:51 AM	Normal	13.6	8.47	2.48	15.7	50.7	14100
	7/8/03 10:54 AM	Repeat	13.6	8.47	2.50	15.7	50.7	14000
RPD			0.00%	0.0%	0.80%	0.00%	0.00%	0.71%
7	7/8/03 11:24 AM	Normal	3.82	3.39	1.26	3.42	6.07	14800
	7/8/03 11:27 AM	Repeat	3.84	3.29	1.36	3.24	6.01	14800
RPD			0.52%	2.99%	7.63%	5.41%	0.99%	0.00%
8	7/8/03 12:00 PM	Normal	3.69	2.87	0.859	3.32	6.82	15700
	7/8/03 12:03 PM	Repeat	3.75	2.83	0.794	3.30	6.67	15400
RPD			1.61%	1.40%	7.86%	0.60%	2.22%	1.93%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
9	7/8/03 12:36 PM	Normal	10.1	3.76	1.00	15.2	26	14400
	7/8/03 12:39 PM	Repeat	10.2	3.82	0.991	15.3	25.9	14300
RPD			0.99%	1.58%	0.90%	0.66%	0.39%	0.70%
10	7/8/03 1:09 PM	Normal	9.37	6.37	2.37	6.28	18.0	13800
	7/8/03 1:12 PM	Repeat	9.34	6.27	2.36	6.22	17.9	13800
RPD			0.32%	1.58%	0.42%	0.96%	0.56%	0.00%
11	7/8/03 1:42 PM	Normal	3.5	2.45	0.933	2.48	5.19	13400
	7/8/03 1:45 PM	Repeat	3.58	2.4	0.994	2.36	5.13	13400
RPD			2.3%	2.1%	6.33%	4.96%	1.16%	0.00%
12	7/8/03 2:15 PM	Normal	898	185	27.8	526	2900	14100
	7/8/03 2:18 PM	Repeat	907	186	28.6	536	2960	14100
RPD			1.00%	0.54%	2.84%	1.88%	2.05%	0.00%
13	7/8/03 3:00 PM	Normal	6.57	3.6	1.24	9.44	18.0	13500
	7/8/03 3:03 PM	Repeat	6.42	3.57	1.12	8.38	16.8	13500
RPD			2.31%	0.84%	10.2%	11.9%	6.9%	0.00%
14	7/10/03 9:47 AM	Normal	51.3	12.6	3.03	35.6	123	13800
	7/10/03 9:50 AM	Repeat	50.9	12.5	2.88	35.7	122	14000
RPD			0.78%	0.80%	5.08%	0.28%	0.82%	1.44%
15	7/18/03 11:58 AM	Normal	12	8.33	4.8	17.7	33.9	11000
	7/18/03 12:01 PM	Repeat	11.9	8.29	4.7	17.8	33.6	11200
RPD			0.84%	0.48%	2.1%	0.56%	0.89%	1.80%
16	7/18/03 12:01 PM	Repeat	11.9	8.29	4.7	17.8	33.6	11200
	7/18/03 12:04 PM	Repeat	11.9	8.31	4.7	17.7	33.7	11500
RPD			0.00%	0.24%	0.00%	0.56%	0.30%	2.64%
17	8/4/03 12:29 PM	Normal	6.73	5.12	2.8	10.6	42.5	22100
	8/4/03 12:32 PM	Repeat	6.75	5.28	2.9	10.8	42.7	22100
RPD			0.30%	3.08%	3.5%	1.87%	0.47%	0.00%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
18	8/4/03 1:08 PM	Normal	4.85	1.95	1.1	4.35	10.6	20800
	8/4/03 1:11 PM	Repeat	4.82	1.78	1.05	4.18	10.1	20700
RPD			0.62%	9.12%	4.7%	3.99%	4.83%	0.48%
19	8/4/03 1:44 PM	Normal	4.3	1.92	0.56	2.27	6.7	20400
	8/4/03 1:47 PM	Repeat	14.3	3.77	3.33	6.13	3.95	20500
RPD			1.1E+02 %	65.0%	1.4E+02 %	91.9%	52%	0.49%
20	8/4/03 2:20 PM	Normal	5.37	2.48	0.654	4.13	10.2	20200
	8/4/03 2:23 PM	Repeat	5.35	2.47	0.57	3.94	9.84	20200
RPD			0.37%	0.40%	14%	4.71%	3.59%	0.00%
21	8/4/03 2:53 PM	Normal	3.61	2.32	0.441	1.48	5.17	20200
	8/4/03 2:56 PM	Repeat	3.64	2.24	0.503	1.4	5.11	20100
RPD			0.83%	3.51%	13.1%	5.6%	1.17%	0.50%
22	8/4/03 3:26 PM	Normal	5.56	2.95	0.575	2.11	8.32	19800
	8/4/03 3:29 PM	Repeat	5.64	2.85	0.553	2.15	8.38	19700
RPD			1.43%	3.45%	3.90%	1.88%	0.72%	0.51%
23	8/5/03 11:08 AM	Normal	13.9	6.97	3.03	22.8	48.4	30400
	8/5/03 11:11 AM	Repeat	13.7	7.03	3.1	23.1	48.9	30200
RPD			1.45%	0.86%	2.3%	1.31%	1.03%	0.66%
24	8/5/03 11:47 AM	Normal	3.15	2.06	0.852	2.3	4.56	22800
	8/5/03 11:50 AM	Repeat	3.08	2.05	0.759	2.22	4.44	22600
RPD			2.25%	0.49%	11.5%	3.5%	2.67%	0.88%
25	8/5/03 12:20 PM	Normal	14.6	10.3	3.72	10.6	32.1	21300
	8/5/03 12:23 PM	Repeat	14.7	10.4	3.82	10.5	32.1	21200
RPD			0.68%	0.97%	2.65%	0.95%	0.00%	0.47%
26	8/6/03 11:21 AM	Normal	9.28	3.25	1.63	9.24	19.9	17400
	8/6/03 11:24 AM	Repeat	9.23	3.25	1.57	9.01	19.3	17200
RPD			0.54%	0.00%	3.75%	2.52%	3.06%	1.16%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
27	8/6/03 11:57 AM	Normal	7.77	6.4	1.87	8.79	20.6	16700
	8/6/03 12:00 PM	Repeat	7.78	6.49	1.85	8.86	20.7	16600
RPD			0.13%	1.4%	1.08%	0.79%	0.48%	0.60%
28	8/14/03 12:01 PM	Normal	9.52	6.2	3.96	13.3	25.3	12800
	8/14/03 12:04 PM	Repeat	9.48	6.12	3.87	13.2	25.3	12800
RPD			0.42%	1.3%	2.30%	0.75%	0.00%	0.00%
29	9/2/03 11:51 AM	Normal	2.18	1.82	0.841	0.87	3.55	20900
	9/2/03 11:54 AM	Repeat	2.32	1.72	0.751	0.735	3.54	20700
RPD			6.22%	5.65%	11.3%	16.82%	0.28%	0.96%
30	9/2/03 12:24 PM	Normal	2.39	0.984	0.277	0.0538	0.183	16700
	9/2/03 12:27 PM	Repeat	2.44	0.879	0.241	0.132	0.135	16700
RPD			2.07%	11.3%	13.9%	84.2%	30.2%	0.00%
31	9/2/03 12:57 PM	Normal	2.64	1.87	0.283	0.905	2.96	18100
	9/2/03 1:00 PM	Repeat	2.57	1.95	0.242	0.875	2.96	18000
RPD			2.69%	4.19%	15.6%	3.37%	0.00%	0.55%
32	9/2/03 1:30 PM	Normal	2.86	1.84	0.261	0.625	2.09	17300
	9/2/03 1:33 PM	Repeat	2.91	1.91	0.269	0.629	2.07	17200
RPD			1.73%	3.73%	3.02%	0.64%	0.96%	0.58%
33	9/2/03 2:03 PM	Normal	4.12	3.11	0.664	2.49	6.22	19700
	9/2/03 2:06 PM	Repeat	4.01	3.15	0.627	2.51	6.26	19500
RPD			2.71%	1.28%	5.73%	0.80%	0.64%	1.02%
34	9/3/03 9:13 AM	Normal	24.7	8.13	2.61	21.4	56.7	14100
	9/3/03 9:16 AM	Repeat	24.9	8.29	2.51	21.4	57	14200
RPD			0.81%	1.95%	3.91%	0.00%	0.53%	0.71%
35	9/3/03 9:46 AM	Normal	6.13	4.55	1.56	6.33	13.3	14200
	9/3/03 9:49 AM	Repeat	6.19	4.55	1.47	6.32	13.1	14200
RPD			0.97%	0.0%	5.9%	0.16%	1.52%	0.00%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
36	9/3/03 11:01 AM	Normal	11.8	8.18	2.5	13.2	31.3	14700
	9/3/03 11:04 AM	Repeat	12	8.11	2.6	13.1	31.2	14800
RPD			1.7%	0.86%	3.9%	0.76%	0.32%	0.68%
37	9/3/03 11:37 AM	Normal	4.23	2.87	0.676	3.1	5.81	15000
	9/3/03 11:40 AM	Repeat	4.17	2.95	0.673	3.01	5.74	15000
RPD			1.43%	2.75%	0.44%	2.9%	1.21%	0.00%
38	9/3/03 12:10 PM	Normal	6.81	3.12	0.866	7.31	12.7	15100
	9/3/03 12:13 PM	Repeat	6.91	3.13	0.823	7.34	12.6	15100
RPD			1.46%	0.32%	5.09%	0.41%	0.79%	0.00%
39	9/4/03 9:35 AM	Normal	3.14	1.97	1.02	2.02	5.7	12300
	9/4/03 9:38 AM	Repeat	3.1	1.91	0.901	1.92	5.53	12300
RPD			1.3%	3.09%	12.4%	5.08%	3.0%	0.00%
40	9/4/03 10:14 AM	Normal	6.8	2.36	1.5	6.2	14.2	12300
	9/4/03 10:17 AM	Repeat	6.94	2.28	1.41	6.18	13.9	12400
RPD			2.0%	3.45%	6.2%	0.32%	2.14%	0.81%
41	9/4/03 10:50 AM	Normal	5.97	3.62	1.87	6.22	12.5	12500
	9/4/03 10:53 AM	Repeat	5.96	3.52	1.83	6.17	12.3	12500
RPD			0.17%	2.80%	2.16%	0.81%	1.61%	0.00%
42	10/7/03 11:06 AM	Normal	2.17	2.29	2.76	1.16	4.66	14200
	10/7/03 11:09 AM	Repeat	2.22	2.3	2.72	0.965	4.61	14100
RPD			2.28%	0.44%	1.46%	18.4%	1.08%	0.71%
43	10/7/03 11:39 AM	Normal	3.13	2.83	1.1	3.19	6.97	13400
	10/7/03 11:42 AM	Repeat	3.08	2.93	1.06	3.22	7.01	13300
RPD			1.61%	3.47%	3.7%	0.94%	0.57%	0.75%
44	10/7/03 12:12 PM	Normal	1.67	1.06	0.243	0.511	0.655	13600
	10/7/03 12:15 PM	Repeat	1.57	1.06	0.241	0.392	0.708	13600
RPD			6.17%	0.00%	0.83%	26.4%	7.78%	0.00%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
45	10/7/03 1:20 PM	Normal	3.44	2.73	0.898	3.02	9.01	15200
	10/7/03 1:23 PM	Repeat	3.43	2.76	0.936	3.02	9.02	15000
RPD			0.29%	1.09%	4.14%	0.00%	0.11%	1.32%
46	10/7/03 1:51 PM	Normal	3.26	2.83	0.731	2.91	8.26	14100
	10/7/03 1:53 PM	Repeat	3.34	2.78	0.729	2.93	8.34	14100
RPD			2.42%	1.78%	0.27%	0.68%	0.96%	0.00%
47	10/7/03 2:23 PM	Normal	26.1	16.3	4.58	33.4	134	14600
	10/7/03 2:26 PM	Repeat	25.3	15.6	4.46	31.4	119	14700
RPD			3.11%	4.39%	2.65%	6.17%	11.9%	0.68%
48	10/7/03 2:59 PM	Normal	4.13	3.77	1.08	4.57	15.8	12900
	10/7/03 3:02 PM	Repeat	4.13	3.67	1.04	4.51	15.8	12900
RPD			0.00%	2.69%	3.77%	1.32%	0.00%	0.00%
49	10/8/03 12:17 PM	Normal	15.5	6.81	1.92	32.2	82.3	15800
	10/8/03 12:20 PM	Repeat	15.5	6.84	1.85	32.1	82.4	15700
RPD			0.00%	0.44%	3.71%	0.31%	0.12%	0.63%
50	10/8/03 1:02 PM	Normal	7.74	3.03	0.88	14.7	34.6	15700
	10/8/03 1:05 PM	Repeat	7.57	2.93	0.885	14.6	34	15700
RPD			2.22%	3.36%	0.57%	0.68%	1.7%	0.00%
51	10/8/03 1:41 PM	Normal	8.4	5.23	1.66	13.4	29.1	14700
	10/8/03 1:44 PM	Repeat	8.33	5.27	1.67	13.2	28.6	14700
RPD			0.84%	0.76%	0.60%	1.50%	1.73%	0.00%
52	10/9/03 10:58 AM	Normal	8.63	5.8	2.8	10.9	52.3	11600
	10/9/03 11:01 AM	Repeat	8.52	5.61	2.69	10.6	52.3	11500
RPD			1.28%	3.3%	4.0%	2.79%	0.00%	0.87%
53	11/3/03 1:45 PM	Normal	1.83	2.69	1.13	1.71	5.47	9710
	11/3/03 1:51 PM	Repeat	1.69	2.66	1.1	1.54	5.42	9480
RPD			7.95%	1.12%	2.7%	10.46%	0.92%	2.40%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
54	11/3/03 1:51 PM	Normal	1.69	2.66	1.10	1.54	5.42	9480
	11/3/03 1:54 PM	Repeat	1.94	2.1	2.86	1.12	4.47	9390
RPD			13.8%	24%	89%	31.6%	19.2%	0.95%
55	11/3/03 2:51 PM	Normal	2.66	2.24	0.776	2.49	5.93	9140
	11/3/03 2:54 PM	Repeat	2.66	2.3	0.773	2.45	5.98	9120
RPD			0.00%	2.6%	0.39%	1.62%	0.84%	0.22%
56	11/4/03 10:04 AM	Normal	4.07	3.41	1.93	4.24	10.2	6320
	11/4/03 10:07 AM	Repeat	4.12	3.33	1.79	4.15	9.75	6310
RPD			1.22%	2.37%	7.53%	2.15%	4.51%	0.16%
57	11/4/03 12:07 PM	Normal	4.27	4.07	2.61	4.32	10	6730
	11/4/03 12:10 PM	Repeat	4.14	4.13	2.65	4.19	9.85	6730
RPD			3.09%	1.46%	1.52%	3.06%	1.5%	0.00%
58	11/4/03 1:22 PM	Normal	6.84	2.58	0.913	13.5	31.7	7010
	11/4/03 1:25 PM	Repeat	6.78	2.49	0.844	13.4	31.4	6980
RPD			0.88%	3.55%	7.85%	0.74%	0.95%	0.43%
59	11/4/03 2:04 PM	Normal	18.3	9.37	1.74	23.2	80.9	6680
	11/4/03 2:07 PM	Repeat	18.3	9.44	1.77	23.2	81.1	6660
RPD			0.00%	0.74%	1.71%	0.00%	0.25%	0.30%
60	11/4/03 2:37 PM	Normal	8.02	5.13	1.08	14	39	6740
	11/4/03 2:40 PM	Repeat	7.76	5.16	1.03	13.9	38.7	6730
RPD			3.30%	0.58%	4.74%	0.72%	0.77%	0.15%
61	11/4/03 3:14 PM	Normal	28.6	17.6	2.24	31.9	132	6550
	11/4/03 3:16 PM	Repeat	28.6	17.6	2.26	32	133	6560
RPD			0.00%	0.00%	0.89%	0.31%	0.75%	0.15%
62	11/4/03 3:43 PM	Normal	34.1	10.1	1.4	41	123	6470
	11/4/03 3:46 PM	Repeat	34.4	10.3	1.47	41.5	124	6460
RPD			0.88%	1.96%	4.9%	1.2%	0.81%	0.15%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
63	12/1/03 2:45 PM	Normal	9.04	3.29	1.82	14.6	33.5	12300
	12/1/03 2:48 PM	Repeat	9.15	3.25	1.77	14.6	33.5	12300
RPD			1.21%	1.22%	2.79%	0.00%	0.00%	0.00%
64	12/1/03 3:24 PM	Normal	15.3	9.12	3.58	17.6	52.3	12000
	12/1/03 3:27 PM	Repeat	15.3	9.11	3.54	17.6	52	12000
RPD			0.00%	0.11%	1.12%	0.00%	0.58%	0.00%
65	12/1/03 4:06 PM	Normal	2.72	1.45	0.932	4.04	9.51	11700
	12/1/03 4:09 PM	Repeat	2.7	1.32	0.935	4.02	9.41	11600
RPD			0.74%	9.39%	0.32%	0.50%	1.06%	0.86%
66	12/2/03 10:51 AM	Normal	389	138	19.3	191	1360	8070
	12/2/03 10:57 AM	Repeat	389	138	19.1	194	1370	8220
RPD			0.00%	0.00%	1.04%	1.56%	0.73%	1.84%
67	12/2/03 11:33 AM	Normal	8.67	4.4	1.58	13.7	42.9	7700
	12/2/03 11:42 AM	Repeat	8.76	4.48	1.64	13.9	43	7760
RPD			1.03%	1.8%	3.73%	1.45%	0.23%	0.78%
68	12/2/03 12:12 PM	Normal	10.5	8.81	6.1	33.6	59.4	8120
	12/2/03 12:15 PM	Repeat	10.4	8.84	6.11	34	59.8	8210
RPD			0.96%	0.34%	0.16%	1.2%	0.67%	1.10%
69	12/2/03 12:58 PM	Normal	50.3	15.9	2.98	63	188	8460
	12/2/03 1:01 PM	Repeat	50.5	15.9	3.01	64.3	190	8460
RPD			0.40%	0.00%	1.00%	2.0%	1.06%	0.00%
70	12/2/03 1:43 PM	Normal	46.5	12.8	2.36	70.7	162	8790
	12/2/03 1:46 PM	Repeat	47	12.9	2.37	72.1	164	8840
RPD			1.1%	0.78%	0.42%	1.96%	1.23%	0.57%
71	12/2/03 2:28 PM	Normal	8.01	5.76	1.64	10.8	26.9	9090
	12/2/03 2:31 PM	Repeat	8.07	5.82	1.66	10.7	26.8	9110
RPD			0.75%	1.04%	1.21%	0.93%	0.37%	0.22%

Table A-2. (continued).

	Date and Time	Type	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Water (ppmv)
72	12/3/03 3:21 PM	Normal	3.52	2.54	12.2	2.87	8.56	11300
	12/3/03 3:24 PM	Repeat	3.48	2.53	12	2.86	8.61	11300
RPD			1.14%	0.39%	1.7%	0.35%	0.58%	0.00%
73	12/4/03 10:21 AM	Normal	1.54	1.23	0.78	0.737	2.1	7020
	12/4/03 10:24 AM	Repeat	1.54	1.12	0.683	0.785	1.95	7040
RPD			0.00%	9.36%	13%	6.31%	7.4%	0.28%
74	12/4/03 10:54 AM	Normal	3.07	1.99	0.575	1.15	2.86	7210
	12/4/03 10:57 AM	Repeat	3.22	1.99	0.465	1.12	2.83	7210
RPD			4.77%	0.00%	21.15%	2.64%	1.05%	0.00%
75	12/4/03 11:27 AM	Normal	1.48	1.01	0.22	0.447	0.879	7340
	12/4/03 11:30 AM	Repeat	1.56	1.07	0.208	0.448	0.842	7440
RPD			5.26%	5.77%	5.6%	0.22%	4.30%	1.35%

CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
PCE = tetrachloroethylene
TCA = trichloroethane
TCE = trichloroethylene
RPD = relative percent difference

Appendix B

Analytical Accuracy

Appendix B

Analytical Accuracy

Standards (i.e., premixed gas samples at verified concentrations) were purchased at concentrations of 1, 5, 100, 500, and 1,000 ppm. These standard gases were analyzed before analysis of each set of vapor samples from the vadose zone at the Radioactive Waste Management Complex to quantify and validate instrument performance. Table B-1 and Figures B-1, B-2, B-3, B-4, and B-5 illustrate the accuracy of the Brüel and Kjær photoacoustic gas analyzer during the end-year 2003 operational period.

Table B-1. Brüel and Kjær photoacoustic gas analyzer sampling accuracy.

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	CCl_4 Standard Gas Standard	Lower 20%	Upper 20%
1 PPM MIX	07-Jul-03	1.26	2.13	1.1	1.11	0.945	3340	94%	1.01	0.808	1.212
1 PPM MIX	08-Jul-03	1.14	2.15	1.11	0.928	0.904	3240	90%	1.01	0.808	1.212
1 PPM MIX	10-Jul-03	1.22	2.13	1.07	1.12	1.24	2620	123%	1.01	0.808	1.212
1 PPM MIX	18-Jul-03	1.37	2.32	1.05	1.13	1.1	4230	109%	1.01	0.808	1.212
1 PPM MIX	18-Jul-03	1.93	2.36	1.11	0.985	0.875	5450	87%	1.01	0.808	1.212
1 PPM MIX	24-Jul-03	1.39	2.18	1.13	1.06	1.04	4260	103%	1.01	0.808	1.212
1 PPM MIX	24-Jul-03	1.55	2.26	1.07	1.01	0.899	4210	89%	1.01	0.808	1.212
1 PPM MIX	31-Jul-03	1.35	2.2	1.16	1.04	1.08	3920	107%	1.01	0.808	1.212
1 PPM MIX	04-Aug-03	1.58	2.19	1.14	1.06	1	5810	99%	1.01	0.808	1.212
1 PPM MIX	05-Aug-03	1.49	2.19	1.02	1.09	0.912	5140	90%	1.01	0.808	1.212
1 PPM MIX	06-Aug-03	1.59	2.2	1.04	1.05	0.94	5310	93%	1.01	0.808	1.212
1 PPM MIX	07-Aug-03	2.05	2.2	1.13	1.02	1.01	7390	100%	1.01	0.808	1.212
1 PPM MIX	14-Aug-03	1.54	2.12	1.1	1.06	1	4310	99%	1.01	0.808	1.212
1 PPM MIX	21-Aug-03	1.58	2.27	1.1	1.03	1.03	4450	102%	1.01	0.808	1.212
1 PPM MIX	28-Aug-03	1.38	2.18	1.1	1.17	1.07	4610	106%	1.01	0.808	1.212
1 PPM MIX	02-Sep-03	1.37	2.1	1.13	1.05	1.04	3970	103%	1.01	0.808	1.212
1 PPM MIX	03-Sep-03	1.32	2.06	1.09	1.04	0.856	4430	85%	1.01	0.808	1.212
1 PPM MIX	04-Sep-03	1.29	2.02	1.06	1.06	0.951	3580	94%	1.01	0.808	1.212
1 PPM MIX	11-Sep-03	1.23	2.18	1.1	1.12	1.1	3520	109%	1.01	0.808	1.212
1 PPM MIX	18-Sep-03	1.28	2.12	1.17	1.16	1.07	2790	106%	1.01	0.808	1.212
1 PPM MIX	25-Sep-03	1.2	2.2	1.11	1.14	1.11	2670	110%	1.01	0.808	1.212
1 PPM MIX	02-Oct-03	1.24	2.23	1.2	1.13	1.1	2690	109%	1.01	0.808	1.212
1 PPM MIX	07-Oct-03	1.2	2.18	1.17	1.16	1.12	2990	111%	1.01	0.808	1.212
1 PPM MIX	08-Oct-03	1.71	2.23	1.32	1.12	0.986	3740	98%	1.01	0.808	1.212
1 PPM MIX	09-Oct-03	1.29	2.52	2.48	1.86	1.46	2870	145%	1.01	0.808	1.212
1 PPM MIX	16-Oct-03	1.19	2.1	1.12	1.11	0.954	2250	94%	1.01	0.808	1.212

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
1 PPM MIX	23-Oct-03	1.25	2.22	1.19	1.13	1.12	2450	111%	1.01	0.808	1.212
1 PPM MIX	30-Oct-03	1.17	2.18	1.19	1.07	1.12	1910	111%	1.01	0.808	1.212
1 PPM MIX	03-Nov-03	1.29	2.23	1.15	1.22	1.14	1930	113%	1.01	0.808	1.212
1 PPM MIX	04-Nov-03	1.08	1.97	1.11	1.01	0.937	1590	93%	1.01	0.808	1.212
1 PPM MIX	06-Nov-03	1.2	2.12	1.01	1.1	1.16	1440	115%	1.01	0.808	1.212
1 PPM MIX	13-Nov-03	1.31	2.15	1.08	1.21	1.21	1770	120%	1.01	0.808	1.212
1 PPM MIX	17-Nov-03	1.29	2.09	1.08	1.19	1.17	2610	116%	1.01	0.808	1.212
1 PPM MIX	20-Nov-03	1.34	3.18	1.08	1.12	1.13	2370	112%	1.01	0.808	1.212
1 PPM MIX	26-Nov-03	0.926	2.43	1.06	1.03	1.07	1890	106%	1.01	0.808	1.212
1 PPM MIX	02-Dec-03	1.04	2.64	1.18	1.23	1.22	2200	121%	1.01	0.808	1.212
1 PPM MIX	03-Dec-03	1.33	2.8	1.16	1.3	1.49	3380	148%	1.01	0.808	1.212
1 PPM MIX	04-Dec-03	0.943	2.45	1.07	1.14	1.08	1960	107%	1.01	0.808	1.212
1 PPM MIX	11-Dec-03	1.13	2.41	1.06	1.2	1.03	1810	102%	1.01	0.808	1.212
1 PPM MIX	18-Dec-03	1.06	2.33	1.16	1.17	1.23	1590	122%	1.01	0.808	1.212
1 PPM MIX	24-Dec-03	1	2.17	1.1	1.19	1.17	1880	116%	1.01	0.808	1.212
5 PPM MIX	06-Aug-03	7.63	14.8	9.73	8.47	7.13	2090	143%	5.00	4.00	6.00
5 PPM MIX	14-Aug-03	6.09	10.4	5.88	5.63	4.67	4220	93%	5.00	4.00	6.00
5 PPM MIX	21-Aug-03	5.85	10.4	5.92	5.44	4.68	4410	94%	5.00	4.00	6.00
5 PPM MIX	28-Aug-03	5.58	10.2	5.97	4.84	4.83	5180	97%	5.00	4.00	6.00
5 PPM MIX	02-Sep-03	5.62	10.4	5.84	4.99	4.77	4380	95%	5.00	4.00	6.00
5 PPM MIX	03-Sep-03	5.56	10.1	5.53	5.08	4.53	4770	91%	5.00	4.00	6.00
5 PPM MIX	04-Sep-03	5.74	10.3	5.91	5.6	4.55	3380	91%	5.00	4.00	6.00
5 PPM MIX	11-Sep-03	5.5	10.1	5.71	4.97	4.39	5390	88%	5.00	4.00	6.00
5 PPM MIX	18-Sep-03	5.66	10.6	6.32	5.7	4.73	2670	95%	5.00	4.00	6.00
5 PPM MIX	25-Sep-03	5.47	10.1	5.71	5.26	4.46	2690	89%	5.00	4.00	6.00
5 PPM MIX	02-Oct-03	5.43	10.2	5.65	5.17	4.56	3200	91%	5.00	4.00	6.00
5 PPM MIX	07-Oct-03	5.83	10.6	6.38	5.88	4.77	3130	95%	5.00	4.00	6.00

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
5 PPM MIX	08-Oct-03	5.48	10.1	5.32	5.23	4.57	2980	91%	5.00	4.00	6.00
5 PPM MIX	08-Oct-03	8.38	15.6	12.1	9.93	7.81	4250	156%	5.00	4.00	6.00
5 PPM MIX	09-Oct-03	6.27	10.3	5.85	5.34	4.69	11000	94%	5.00	4.00	6.00
5 PPM MIX	16-Oct-03	5.1	9.87	5.17	4.96	4.32	2350	86%	5.00	4.00	6.00
5 PPM MIX	23-Oct-03	5.31	9.89	5.32	5.07	4.35	2390	87%	5.00	4.00	6.00
5 PPM MIX	30-Oct-03	5.14	10.2	5.54	5.12	4.67	1730	93%	5.00	4.00	6.00
5 PPM MIX	03-Nov-03	5.16	9.79	5.39	4.93	4.53	2130	91%	5.00	4.00	6.00
5 PPM MIX	04-Nov-03	5.26	10.2	5.42	5.16	4.58	1470	92%	5.00	4.00	6.00
5 PPM MIX	06-Nov-03	5.2	9.99	5.21	5.12	4.69	1100	94%	5.00	4.00	6.00
5 PPM MIX	13-Nov-03	5.23	9.81	5.23	5	4.45	1960	89%	5.00	4.00	6.00
5 PPM MIX	17-Nov-03	5.26	9.83	5.24	5	4.49	2570	90%	5.00	4.00	6.00
5 PPM MIX	20-Nov-03	5.65	11.4	5.48	5.41	4.59	3250	92%	5.00	4.00	6.00
5 PPM MIX	26-Nov-03	5.12	10.7	5.37	5.18	4.57	1510	91%	5.00	4.00	6.00
5 PPM MIX	01-Dec-03	5.35	11	5.68	5.39	4.7	2090	94%	5.00	4.00	6.00
5 PPM MIX	02-Dec-03	5.31	11	5.48	5.19	4.62	2070	92%	5.00	4.00	6.00
5 PPM MIX	03-Dec-03	5.45	10.8	5.33	5.25	4.56	3220	91%	5.00	4.00	6.00
5 PPM MIX	04-Dec-03	5.37	11.1	5.26	5.29	4.57	1980	91%	5.00	4.00	6.00
5 PPM MIX	11-Dec-03	5.06	10.2	5.2	5.04	4.39	1750	88%	5.00	4.00	6.00
5 PPM MIX	18-Dec-03	5.01	10.4	5.07	4.89	4.28	1860	86%	5.00	4.00	6.00
5 PPM MIX	24-Dec-03	5.45	11.8	5.58	5.37	4.4	1750	88%	5.00	4.00	6.00
100 PPM MIX	07-Jul-03	106	180	94.8	93	79.9	4280	81%	98.55	78.84	118.26
100 PPM MIX	08-Jul-03	108	186	102	98.6	84.3	3740	86%	98.55	78.84	118.26
100 PPM MIX	10-Jul-03	108	185	99	97.5	84.2	3560	85%	98.55	78.84	118.26
100 PPM MIX	18-Jul-03	111	191	103	101	87	3870	88%	98.55	78.84	118.26
100 PPM MIX	24-Jul-03	111	192	103	101	87.3	4060	89%	98.55	78.84	118.26
100 PPM MIX	31-Jul-03	107	184	100	96.8	83.5	4940	85%	98.55	78.84	118.26
100 PPM MIX	04-Aug-03	107	184	98.5	96.5	83.8	7660	85%	98.55	78.84	118.26

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
100 PPM MIX	05-Aug-03	105	180	95.6	94	81.8	7300	83%	98.55	78.84	118.26
100 PPM MIX	06-Aug-03	110	190	102	101	87.4	5700	89%	98.55	78.84	118.26
100 PPM MIX	07-Aug-03	111	193	100	99.1	88.8	8520	90%	98.55	78.84	118.26
100 PPM MIX	14-Aug-03	108	186	97.6	97	84.6	4550	86%	98.55	78.84	118.26
100 PPM MIX	21-Aug-03	107	185	98.2	96.5	84.4	6620	86%	98.55	78.84	118.26
100 PPM MIX	28-Aug-03	108	187	99.7	98	85.4	4970	87%	98.55	78.84	118.26
100 PPM MIX	02-Sep-03	113	194	104	101	88.5	5600	90%	98.55	78.84	118.26
100 PPM MIX	03-Sep-03	108	185	99.1	97.1	84.2	6670	85%	98.55	78.84	118.26
100 PPM MIX	04-Sep-03	106	182	100	96.3	82.8	4840	84%	98.55	78.84	118.26
100 PPM MIX	11-Sep-03	110	190	101	98.8	86.1	5660	87%	98.55	78.84	118.26
100 PPM MIX	18-Sep-03	106	183	98.4	95.6	83	4310	84%	98.55	78.84	118.26
100 PPM MIX	25-Sep-03	109	188	102	99.2	85.5	2680	87%	98.55	78.84	118.26
100 PPM MIX	02-Oct-03	104	179	97.7	94.5	81.7	4370	83%	98.55	78.84	118.26
100 PPM MIX	07-Oct-03	110	190	99.8	97.9	86.5	4230	88%	98.55	78.84	118.26
100 PPM MIX	08-Oct-03	104	180	94.6	93.5	82.5	6390	84%	98.55	78.84	118.26
100 PPM MIX	09-Oct-03	104	182	93.2	92.6	84.1	11600	85%	98.55	78.84	118.26
100 PPM MIX	16-Oct-03	110	188	104	99.5	85.3	2880	87%	98.55	78.84	118.26
100 PPM MIX	23-Oct-03	108	185	102	97.7	84	3200	85%	98.55	78.84	118.26
100 PPM MIX	30-Oct-03	103	177	97.1	93.1	79.9	2430	81%	98.55	78.84	118.26
100 PPM MIX	06-Nov-03	109	188	102	98.8	85.2	1430	86%	98.55	78.84	118.26
100 PPM MIX	13-Nov-03	110	190	102	99.3	85.9	1930	87%	98.55	78.84	118.26
100 PPM MIX	17-Nov-03	107	183	98.4	95.5	82.7	3570	84%	98.55	78.84	118.26
100 PPM MIX	01-Dec-03	112	194	106	102	87.5	2750	89%	98.55	78.84	118.26
100 PPM MIX	02-Dec-03	113	196	107	102	88.2	2220	89%	98.55	78.84	118.26
100 PPM MIX	03-Dec-03	111	192	104	100	86.6	3540	88%	98.55	78.84	118.26
100 PPM MIX	11-Dec-03	109	189	102	98.2	84.8	2070	86%	98.55	78.84	118.26
100 PPM MIX	18-Dec-03	114	196	106	102	87.4	1700	89%	98.55	78.84	118.26

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
500 PPM MIX	06-Aug-03	489	901	454	462	415	7010	83%	498.87	399.096	598.644
500 PPM MIX	14-Aug-03	476	875	427	440	400	5310	80%	498.87	399.096	598.644
500 PPM MIX	21-Aug-03	468	856	398	426	390	7550	78%	498.87	399.096	598.644
500 PPM MIX	02-Sep-03	485	886	389	432	404	6210	81%	498.87	399.096	598.644
500 PPM MIX	03-Sep-03	486	889	403	439	405	8170	81%	498.87	399.096	598.644
500 PPM MIX	04-Sep-03	497	911	438	458	415	5790	83%	498.87	399.096	598.644
500 PPM MIX	11-Sep-03	507	927	459	471	424	5680	85%	498.87	399.096	598.644
500 PPM MIX	18-Sep-03	488	883	406	439	402	4300	81%	498.87	399.096	598.644
500 PPM MIX	25-Sep-03	512	930	435	468	424	3490	85%	498.87	399.096	598.644
500 PPM MIX	02-Oct-03	499	915	455	467	418	4490	84%	498.87	399.096	598.644
500 PPM MIX	07-Oct-03	489	900	433	454	414	4850	83%	498.87	399.096	598.644
500 PPM MIX	09-Oct-03	475	886	429	442	408	11800	82%	498.87	399.096	598.644
500 PPM MIX	16-Oct-03	486	890	442	451	406	3560	81%	498.87	399.096	598.644
500 PPM MIX	23-Oct-03	496	905	451	459	413	2920	83%	498.87	399.096	598.644
500 PPM MIX	30-Oct-03	518	947	478	480	432	2110	87%	498.87	399.096	598.644
500 PPM MIX	03-Nov-03	421	766	342	374	345	4030	69%	498.87	399.096	598.644
500 PPM MIX	04-Nov-03	534	981	493	495	447	2070	90%	498.87	399.096	598.644
500 PPM MIX	06-Nov-03	499	912	433	456	415	1700	83%	498.87	399.096	598.644
500 PPM MIX	13-Nov-03	529	966	472	488	441	1840	88%	498.87	399.096	598.644
500 PPM MIX	17-Nov-03	497	911	444	459	414	2950	83%	498.87	399.096	598.644
500 PPM MIX	20-Nov-03	493	909	452	471	422	2580	85%	498.87	399.096	598.644
500 PPM MIX	26-Nov-03	502	919	472	470	419	2000	84%	498.87	399.096	598.644
500 PPM MIX	01-Dec-03	499	912	463	464	416	3020	83%	498.87	399.096	598.644
500 PPM MIX	02-Dec-03	507	928	474	474	423	2580	85%	498.87	399.096	598.644
500 PPM MIX	03-Dec-03	486	891	443	452	406	3800	81%	498.87	399.096	598.644
500 PPM MIX	04-Dec-03	492	903	452	458	411	2430	82%	498.87	399.096	598.644
500 PPM MIX	11-Dec-03	486	893	465	458	407	2260	82%	498.87	399.096	598.644

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
500 PPM MIX	18-Dec-03	466	856	418	431	389	2420	78%	498.87	399.096	598.644
500 PPM MIX	24-Dec-03	487	892	462	461	409	2340	82%	498.87	399.096	598.644
1000 PPM CCL4	07-Jul-03	4.01	1.99	7.17	-18	953	2980	95%	1001.2	800.96	1201.44
1000 PPM CCL4	08-Jul-03	4.12	2.06	7.65	-17	942	3450	94%	1001.2	800.96	1201.44
1000 PPM CCL4	10-Jul-03	4.28	1.97	7.51	-18	958	3240	96%	1001.2	800.96	1201.44
1000 PPM CCL4	18-Jul-03	4.17	2.06	7.53	-17	954	5050	95%	1001.2	800.96	1201.44
1000 PPM CCL4	24-Jul-03	4.09	2.09	7.45	-17	941	5500	94%	1001.2	800.96	1201.44
1000 PPM CCL4	31-Jul-03	3.98	1.87	7.39	-17	936	3630	93%	1001.2	800.96	1201.44
1000 PPM CCL4	04-Aug-03	4.18	1.91	7.33	-16	900	7710	90%	1001.2	800.96	1201.44
1000 PPM CCL4	05-Aug-03	4.09	1.74	7.12	-17	934	5930	93%	1001.2	800.96	1201.44
1000 PPM CCL4	06-Aug-03	7.65	9.85	23.5	-5	932	8280	93%	1001.2	800.96	1201.44
1000 PPM CCL4	07-Aug-03	3.82	1.83	6.86	-16	936	7790	93%	1001.2	800.96	1201.44
1000 PPM CCL4	14-Aug-03	7.4	8.94	22.3	-7.2	947	4800	95%	1001.2	800.96	1201.44
1000 PPM CCL4	21-Aug-03	7.8	9.41	21.3	-5.8	917	5790	92%	1001.2	800.96	1201.44
1000 PPM CCL4	28-Aug-03	3.9	1.77	6.95	-15	899	5800	90%	1001.2	800.96	1201.44
1000 PPM CCL4	02-Sep-03	7.55	8.71	19	-8.4	952	5990	95%	1001.2	800.96	1201.44
1000 PPM CCL4	03-Sep-03	8.4	10.5	23.3	-7.4	979	5700	98%	1001.2	800.96	1201.44
1000 PPM CCL4	04-Sep-03	7.85	9.43	22.3	-6.6	935	4950	93%	1001.2	800.96	1201.44
1000 PPM CCL4	11-Sep-03	9.13	11.5	28.5	-3.5	920	5090	92%	1001.2	800.96	1201.44
1000 PPM CCL4	18-Sep-03	7.55	8.69	20.5	-8.3	955	3510	95%	1001.2	800.96	1201.44
1000 PPM CCL4	25-Sep-03	8.27	10.2	23.1	-6.2	946	2860	94%	1001.2	800.96	1201.44
1000 PPM CCL4	02-Oct-03	8.24	10.3	24.3	-6.2	964	4170	96%	1001.2	800.96	1201.44
1000 PPM CCL4	07-Oct-03	7.71	9.62	21.6	-5.7	921	4680	92%	1001.2	800.96	1201.44
1000 PPM CCL4	08-Oct-03	2.99	0.56	4.45	-16	896	5630	89%	1001.2	800.96	1201.44
1000 PPM CCL4	09-Oct-03	8.52	11.4	24.9	-3.5	921	11600	92%	1001.2	800.96	1201.44
1000 PPM CCL4	16-Oct-03	7.65	9.76	23	-3.6	867	3980	87%	1001.2	800.96	1201.44
1000 PPM CCL4	23-Oct-03	7.75	9.52	23	-5.1	908	3060	91%	1001.2	800.96	1201.44

Table B-1. (continued).

Standard Type	Sample and Analysis Date	$CHCl_3$ ppm	TCA ppm	PCE ppm	TCE ppm	CCl_4 ppm	H_2O ppm	% Error CCl_4	Standard	CCl_4 Standard Gas Lower 20%	Upper 20%
1000 PPM CCL4	30-Oct-03	8.36	10.6	25.2	-3.2	886	2470	88%	1001.2	800.96	1201.44
1000 PPM CCL4	03-Nov-03	7.07	8.06	17.8	-7.5	891	2810	89%	1001.2	800.96	1201.44
1000 PPM CCL4	04-Nov-03	9.06	11.4	27.6	-5.2	969	1860	97%	1001.2	800.96	1201.44
1000 PPM CCL4	06-Nov-03	8.47	10.8	24.1	-2.4	861	1980	86%	1001.2	800.96	1201.44
500 PPM MIX	13-Nov-03	9.43	11.7	27	-4.9	963	2030	96%	1001.2	800.96	1201.44
1000 PPM CCL4	17-Nov-03	8.43	10.2	24.3	-5.9	938	2830	94%	1001.2	800.96	1201.44
1000 PPM CCL4	20-Nov-03	6.07	7.3	16	-10	953	3750	95%	1001.2	800.96	1201.44
1000 PPM CCL4	26-Nov-03	7.68	9.74	23.2	-7.7	970	1720	97%	1001.2	800.96	1201.44
1000 PPM CCL4	01-Dec-03	7.88	9.86	23.2	-7.5	968	2860	97%	1001.2	800.96	1201.44
1000 PPM CCL4	02-Dec-03	8.63	10.9	25.6	-6.2	971	2430	97%	1001.2	800.96	1201.44
1000 PPM CCL4	03-Dec-03	8.28	10.2	23.9	-6.4	956	3810	95%	1001.2	800.96	1201.44
1000 PPM CCL4	04-Dec-03	7.45	9.1	21.2	-9.3	971	2150	97%	1001.2	800.96	1201.44
1000 PPM CCL4	11-Dec-03	8.84	10.9	26.3	-5	936	2240	93%	1001.2	800.96	1201.44
1000 PPM CCL4	18-Dec-03	8.37	9.87	23.8	-7.8	968	1800	97%	1001.2	800.96	1201.44
1000 PPM CCL4	24-Dec-03	9.56	12.4	30.9	-2.3	926	2000	92%	1001.2	800.96	1201.44

CCl_4 = carbon tetrachloride
$CHCl_3$ = chloroform
H_xO = water
PCE = tetrachloroethylene
TCA = trichloroethane
TCE = trichloroethylene
RPD = relative percent difference

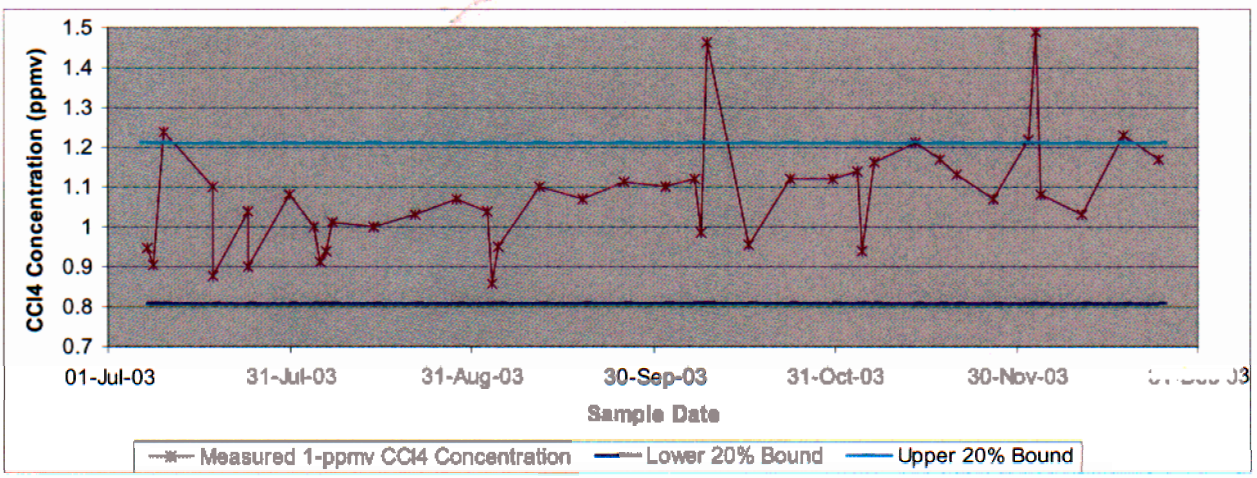

Figure B-1. Brüel and Kjær photoacoustic gas analyzer 1-ppmv carbon tetrachloride standard.

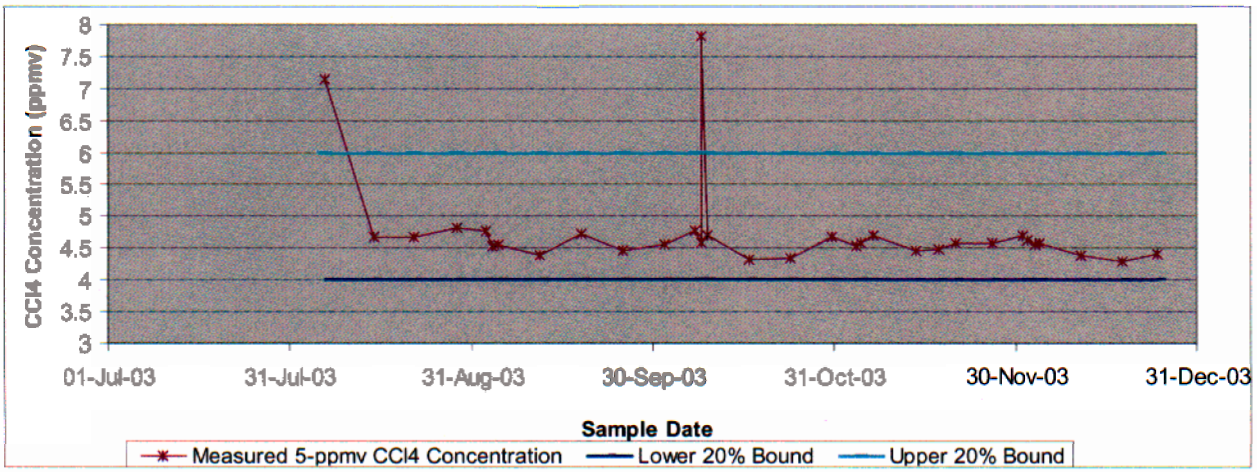

Figure B-2. Brüel and Kjær photoacoustic gas analyzer 5-ppmv carbon tetrachloride standard.

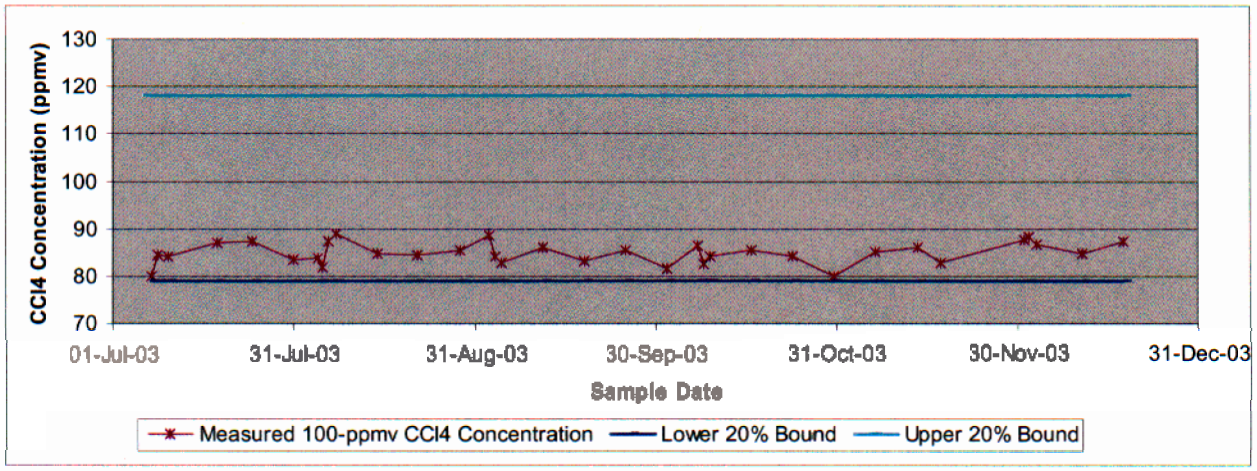

Figure B-3. Brüel and Kjær photoacoustic gas analyzer 100-ppmv carbon tetrachloride standard.

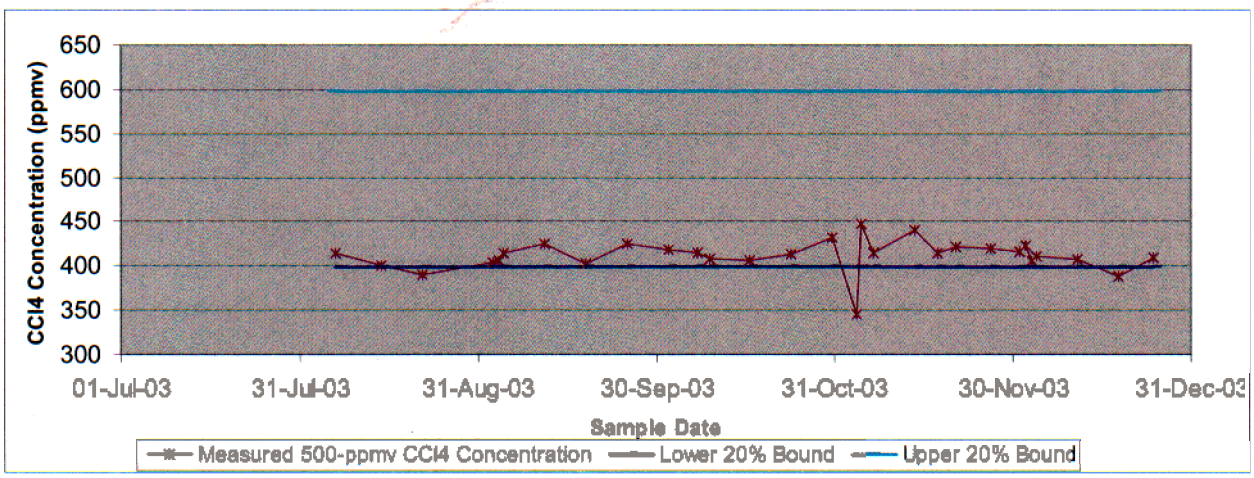

Figure B-4. Brüel and Kjær photoacoustic gas analyzer 500-ppmv carbon tetrachloride standard.

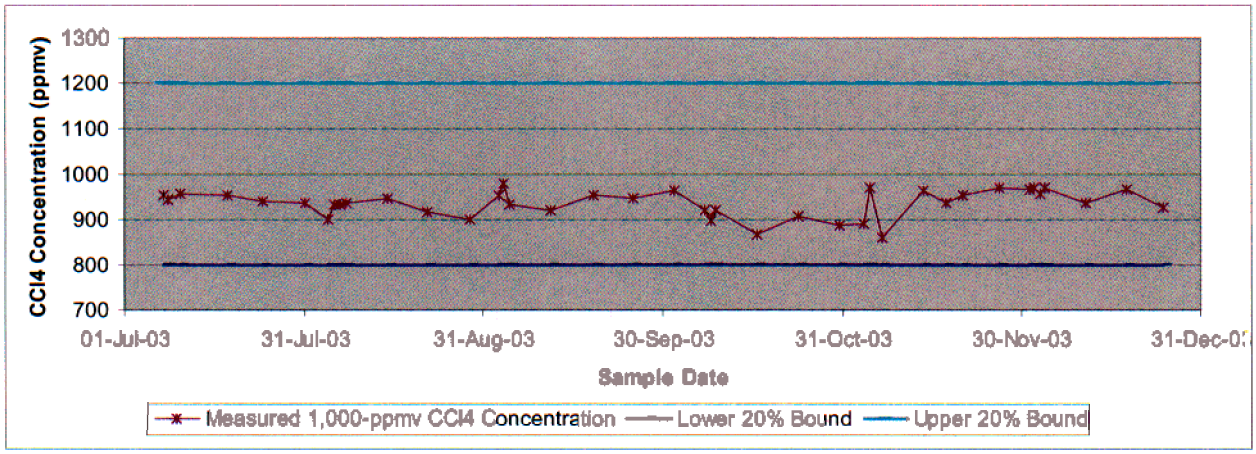

Figure B-5. Brüel and Kjær photoacoustic gas analyzer 1,000-ppmv carbon tetrachloride standard.

Appendix C

Mass Removal Sample Data

Appendix C

Mass Removal Sample Data

Appendix C comprises three tables and four figures. Tables C-1 though C-4 contain the volatile organic compound mass removal from each of the three vapor vacuum extraction units at the Subsurface Disposal Area and a cumulative breakdown, per operating cycle, for mass removal through the end-year 2003 operational period. Figures C-1 and C-2 illustrate the carbon tetrachloride sample concentrations at the units during the end-year 2003 operational period. Figures C-3 and C-4 illustrate the proportion of each volatile organic compound of the cumulative mass removed during the end-year 2003 operational period.

Table C-1. Unit A end-year 2003 mass removal calculation.

				Actual Data						Riemann Sums				
ID Number	Sample Date	Sample Time	Decimal Date	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	$CHCl_3$ (ppmv*day)	1,1,1-TCE (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
START	7/4/2003	16:15	36344.7	6.51E+01	1.59E+01	4.02E+00	4.40E+01	1.56E+02	0.00	91.05	22.24	5.62	61.54	218.18
UNIT A-7/7/03	7/7/2003	11:23	36347.5	6.51E+01	1.59E+01	4.02E+00	4.40E+01	1.56E+02	2.80	119.92	29.29	7.40	81.05	287.35
UNIT A-7/8/03	7/8/2003	8:40	36348.4	5.99E+01	1.43E+01	3.49E+00	4.19E+01	1.37E+02	3.68	55.89	13.34	3.26	39.09	127.82
UNIT A-7/9/03	7/9/2003	8:10	36349.3	5.44E+01	1.19E+01	2.93E+00	3.52E+01	1.11E+02	4.66	53.64	11.73	2.89	34.71	109.46
UNIT A-7/10/03	7/10/2003	8:00	36350.3	5.13E+01	1.26E+01	3.03E+00	3.56E+01	1.23E+02	5.66	129.32	31.76	7.64	89.74	310.06
UNIT A-7/14/03	7/14/2003	9:10	36354.4	3.80E+01	9.83E+00	2.61E+00	2.35E+01	8.40E+01	9.70	94.74	24.51	6.51	58.59	209.42
UNIT A-7/15/03	7/15/2003	7:40	36355.3	5.15E+01	1.35E+01	3.22E+00	3.60E+01	1.29E+02	10.64	55.08	14.44	3.44	38.50	137.96
UNIT A-7/16/03	7/16/2003	12:30	36356.5	4.92E+01	1.12E+01	2.80E+00	3.38E+01	1.02E+02	11.84	49.54	11.28	2.82	34.03	102.71
UNIT A-7/17/03	7/17/2003	8:00	36357.3	5.10E+01	1.17E+01	2.75E+00	3.41E+01	1.07E+02	12.66	139.08	31.91	7.50	92.99	291.80
STOP	7/21/2003	23:24	36362.0	5.76E+01	1.33E+01	3.60E+00	3.95E+01	1.21E+02	17.30	133.68	30.87	8.35	91.67	280.82
START	7/22/2003	18:49	36362.8	5.76E+01	1.33E+01	3.60E+00	3.95E+01	1.21E+02	0.00	25.82	5.96	1.61	17.71	54.24
UNIT A-7/23/03	7/23/2003	16:20	36363.7	4.76E+01	1.22E+01	3.17E+00	3.55E+01	1.21E+02	0.90	36.87	9.45	2.46	27.50	93.73
UNIT A-7/24/03	7/24/2003	8:00	36364.3	1.65E+01	1.09E+01	2.85E+00	3.61E+01	1.04E+02	1.55	38.53	25.45	6.65	84.30	242.85
UNIT A-7/28/03	7/28/2003	8:25	36368.4	3.92E+01	1.11E+01	3.05E+00	2.69E+01	1.05E+02	5.57	98.00	27.75	7.63	67.25	262.50
UNIT A-7/29/03	7/29/2003	8:00	36369.3	4.28E+01	1.08E+01	2.87E+00	3.15E+01	1.00E+02	6.55	42.80	10.80	2.87	31.50	100.00
UNIT A-7/30/03	7/30/2003	8:25	36370.4	4.19E+01	1.01E+01	2.51E+00	3.03E+01	9.24E+01	7.57	41.90	10.10	2.51	30.30	92.40
UNIT A-7/31/03	7/31/2003	8:00	36371.3	4.83E+01	1.10E+01	2.81E+00	3.66E+01	1.02E+02	8.55	121.76	27.73	7.08	92.26	257.12
UNIT A-8/4/03	8/4/2003	9:25	36375.4	3.52E+01	8.73E+00	2.40E+00	2.39E+01	7.91E+01	12.61	88.67	21.99	6.05	60.21	199.26
UNIT A-8/5/3	8/5/2003	8:55	36376.4	3.52E+01	9.22E+00	2.28E+00	2.50E+01	8.76E+01	13.59	34.59	9.06	2.24	24.57	86.08
UNIT A-8/6/03	8/6/2003	8:35	36377.4	4.64E+01	1.11E+01	2.68E+00	3.53E+01	1.03E+02	14.57	45.51	10.89	2.63	34.63	101.03
UNIT A-8/7/03	8/7/2003	8:00	36378.3	4.20E+01	1.00E+01	2.43E+00	3.23E+01	9.43E+01	15.55	105.36	25.09	6.10	81.03	236.57
UNIT A-8/11/03	8/11/2003	9:00	36382.4	3.96E+01	9.85E+00	3.75E+00	2.92E+01	8.65E+01	19.59	99.00	24.63	9.38	73.00	216.25
UNIT A-8/12/03	8/12/2003	8:00	36383.3	3.86E+01	9.42E+00	3.37E+00	2.89E+01	8.45E+01	20.55	37.80	9.22	3.30	28.30	82.74
UNIT A-8/13/03	8/13/2003	8:00	36384.3	3.96E+01	9.85E+00	3.75E+00	2.92E+01	8.65E+01	21.55	39.60	9.85	3.75	29.20	86.50
UNIT A-8/14/03	8/14/2003	8:00	36385.3	3.86E+01	9.42E+00	3.37E+00	2.89E+01	8.45E+01	22.55	97.04	23.68	8.47	72.65	212.42
UNIT A-8/18/03	8/18/2003	8:40	36389.4	3.57E+01	1.04E+01	5.91E+00	2.62E+01	8.50E+01	26.58	89.56	26.09	14.83	65.73	213.24
UNIT A-8/19/03	8/19/2003	8:25	36390.4	4.27E+01	1.16E+01	5.15E+00	3.32E+01	1.03E+02	27.57	42.70	11.60	5.15	33.20	103.00
UNIT A-8/20/03	8/20/2003	8:40	36391.4	4.11E+01	1.02E+01	4.34E+00	3.22E+01	8.73E+01	28.58	40.74	10.11	4.30	31.92	86.54
UNIT A-8/21/03	8/21/2003	8:00	36392.3	4.22E+01	1.04E+01	3.96E+00	3.26E+01	9.32E+01	29.55	105.06	25.89	9.86	81.16	232.03
UNIT A-8/25/03	8/25/2003	8:10	36396.3	3.78E+01	9.78E+00	2.69E+00	2.70E+01	9.23E+01	33.56	94.83	24.53	6.75	67.73	231.55

Table C-1. (continued).

ID Number	Sample Date	Sample Time	Decimal Date	Actual Data $CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	Riemann Sums $CHCl_3$ (ppmv*day)	1,1,1-TCE (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
UNIT A-8/26/03	8/26/2003	8:25	36397.4	4.08E+01	1.09E+01	2.81E+00	3.22E+01	1.08E+02	34.57	39.95	10.67	2.75	31.53	105.75
UNIT A-8/27/03	8/27/2003	7:10	36398.3	4.32E+01	9.69E+00	2.50E+00	3.36E+01	8.94E+01	35.51	43.12	9.67	2.50	33.54	89.24
UNIT A-8/28/03	8/28/2003	8:20	36399.3	3.82E+01	8.94E+00	2.10E+00	2.95E+01	8.50E+01	36.56	115.59	27.05	6.35	89.27	257.21
UNIT A-9/02/03	9/2/2003	8:25	36404.4	3.01E+01	8.71E+00	5.40E+00	2.41E+01	7.24E+01	41.57	90.72	26.25	16.28	72.63	218.21
UNIT A-9/03/03	9/3/2003	9:00	36405.4	4.28E+01	1.13E+01	4.91E+00	3.30E+01	1.02E+02	42.59	42.43	11.20	4.87	32.71	101.11
UNIT A-9/04/03	9/4/2003	8:00	36406.3	4.43E+01	1.18E+01	4.48E+00	3.75E+01	1.10E+02	43.55	111.98	29.83	11.32	94.79	278.06
UNIT A-9/8/03	9/8/2003	10:20	36410.4	4.12E+01	1.07E+01	7.94E+00	3.15E+01	7.98E+01	47.65	103.14	26.79	19.88	78.86	199.78
UNIT A-9/9/03	9/9/2003	8:10	36411.3	4.15E+01	1.08E+01	6.24E+00	3.18E+01	8.93E+01	48.56	39.41	10.26	5.93	30.20	84.80
UNIT A-9/10/03	9/10/2003	7:55	36412.3	4.37E+01	1.07E+01	5.46E+00	3.30E+01	8.95E+01	49.55	43.55	10.66	5.44	32.89	89.19
UNIT A-9/11/03	9/11/2003	8:00	36413.3	3.57E+01	9.21E+00	4.40E+00	2.64E+01	7.78E+01	50.55	45.16	11.65	5.57	33.39	98.41
STOP	9/12/2003	20:38	36414.9	3.57E+01	9.21E+00	4.40E+00	2.64E+01	7.78E+01	52.08	27.25	7.03	3.36	20.15	59.38
START	9/15/2003	16:24	36417.7	3.03E+01	8.69E+00	3.02E+00	2.44E+01	8.23E+01	0.00	10.32	2.96	1.03	8.31	28.03
UNIT A-9/16/03	9/16/2003	8:45	36418.4	5.71E+01	1.56E+01	4.07E+00	4.95E+01	1.55E+02	0.68	47.31	12.92	3.37	41.01	128.41
UNIT A-9/17/03	9/17/2003	8:10	36419.3	4.80E+01	1.15E+01	3.31E+00	3.81E+01	1.10E+02	1.66	47.25	11.32	3.26	37.50	108.28
UNIT A-9/18/03	9/18/2003	8:00	36420.3	4.80E+01	1.15E+01	3.31E+00	3.81E+01	1.10E+02	2.65	121.83	29.19	8.40	96.71	279.20
UNIT A-9/22/03	9/22/2003	10:00	36424.4	4.85E+01	1.39E+01	6.67E+00	3.78E+01	1.29E+02	6.73	121.42	34.80	16.70	94.63	322.95
UNIT A-9/23/03	9/23/2003	8:10	36425.3	5.15E+01	1.39E+01	5.55E+00	4.35E+01	1.35E+02	7.66	49.00	13.22	5.28	41.39	128.44
UNIT A-9/24/03	9/24/2003	7:40	36426.3	4.41E+01	1.08E+01	4.30E+00	3.53E+01	9.82E+01	8.64	44.41	10.87	4.33	35.55	98.88
UNIT A-9/25/03	9/25/2003	8:30	36427.4	1.29E+01	9.43E+00	6.12E+00	1.74E+01	3.71E+01	9.67	6.67	4.88	3.17	9.00	19.19
								Total days	79.04	3399	872	299	2570	7960
									avg/day	43	11	4	33	101
									(ft^3)	1958	503	172	1480	4585
									n	2263	581	199	1711	5300
									(lb)	596	171	73	496	1797
									Total (lb)	3132		Total Hours	1897.07	

CCl_4 = carbon tetrachloride $CHCl_3$ = chloroform PCE = tetrachloroethylene TCA = trichloroethane TCE = trichloroethylene

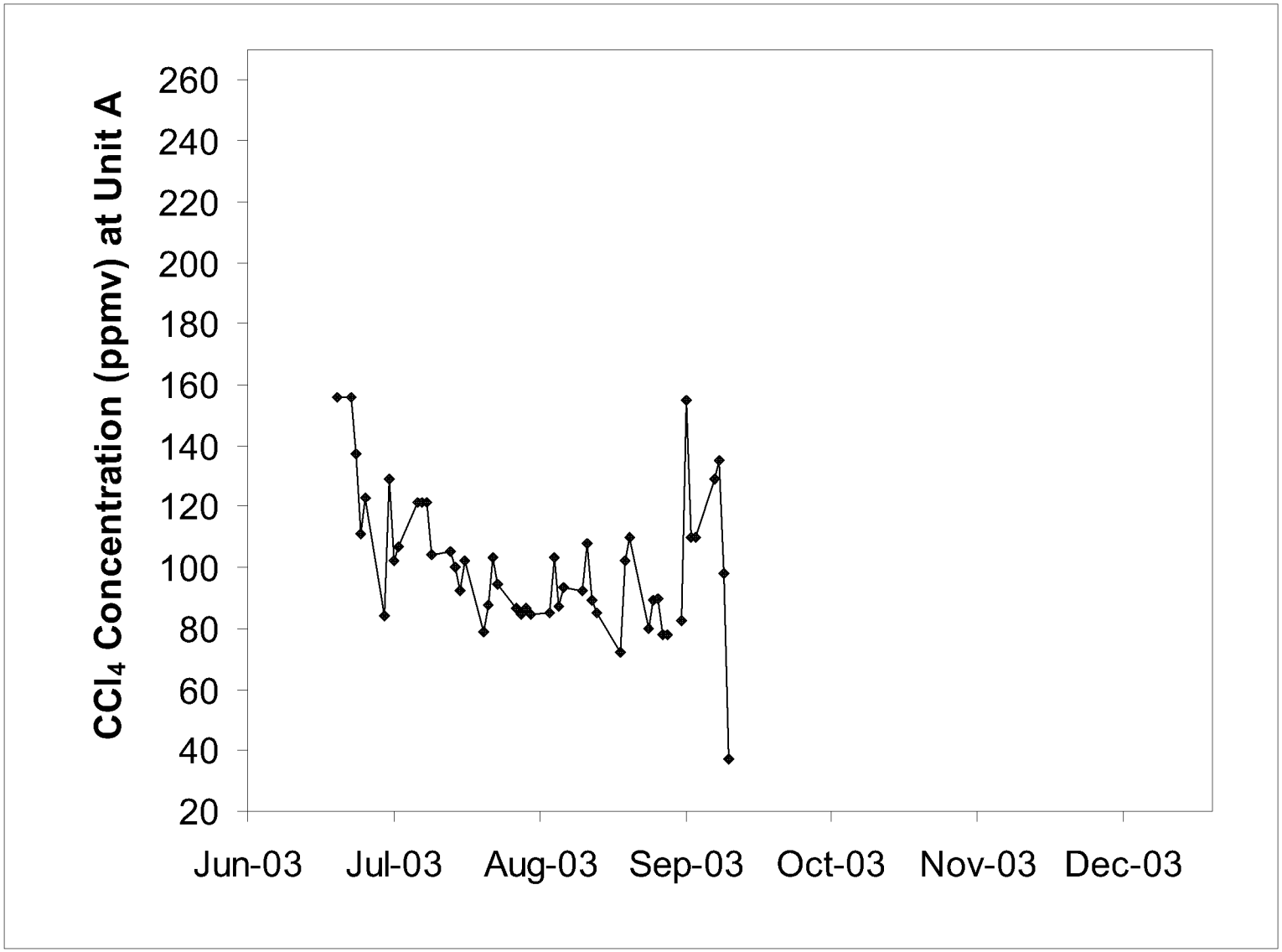

Figure C-1. Unit A end-year 2003 inlet carbon tetrachloride sample concentration.

Table C-2. Unit D end-year 2003 mass removal calculations.

				Actual Data						Riemann Sums				
ID Number	Sample Date	Sample Time	Decimal Date	$CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	$CHCl_3$ (ppmv*day)	1,1,1-TCA (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
START	7/4/2003	13:31	36344.6	1.72E+01	1.02E+01	5.38E+00	2.11E+01	4.83E+01	0.00	24.89	14.76	7.78	30.53	69.88
UNIT D-7/7/03	7/7/2003	10:58	36347.5	1.72E+01	1.02E+01	5.38E+00	2.11E+01	4.83E+01	2.89	32.60	19.33	10.20	39.99	91.55
UNIT D-7/8/03	7/8/2003	8:30	36348.4	1.36E+01	8.51E+00	4.67E+00	1.84E+01	4.34E+01	3.79	12.85	8.04	4.41	17.39	41.02
UNIT D-7/9/03	7/9/2003	8:20	36349.3	1.47E+01	1.07E+01	6.33E+00	2.33E+01	4.60E+01	4.78	14.55	10.59	6.26	23.06	45.52
UNIT D-7/10/03	7/10/2003	8:00	36350.3	1.38E+01	9.45E+00	5.76E+00	2.17E+01	3.99E+01	5.77	34.84	23.85	14.54	54.78	100.72
UNIT D-7/14/03	7/14/2003	9:30	36354.4	1.21E+01	7.42E+00	3.99E+00	1.56E+01	3.34E+01	9.83	30.40	18.64	10.02	39.19	83.92
STOP	7/15/2003	8:36	36355.4	1.21E+01	7.42E+00	3.99E+00	1.56E+01	3.34E+01	10.80	5.82	3.57	1.92	7.51	16.07
START	7/15/2003	13:57	36355.6	1.19E+01	7.38E+00	4.09E+00	1.57E+01	3.27E+01	0.00	4.56	2.83	1.57	6.01	12.52
UNIT D-7/16/03	7/16/2003	8:20	36356.3	1.19E+01	7.38E+00	4.09E+00	1.57E+01	3.27E+01	0.77	10.42	6.47	3.58	13.75	28.65
UNIT D-7/17/03	7/17/2003	8:00	36357.3	1.20E+01	8.33E+00	4.80E+00	1.77E+01	3.39E+01	1.75	33.77	23.44	13.51	49.81	95.39
STOP	7/21/2003	23:24	36362.0	1.46E+01	7.13E+00	3.59E+00	1.37E+01	2.88E+01	6.39	33.88	16.55	8.33	31.80	66.84
START	7/22/2003	17:15	36362.7	1.37E+01	7.61E+00	4.21E+00	1.58E+01	3.20E+01	0.00	6.49	3.61	2.00	7.49	15.17
UNIT D-7/23/03	7/23/2003	16:00	36363.7	1.20E+01	7.18E+00	4.04E+00	1.53E+01	3.00E+01	0.95	9.69	5.80	3.26	12.35	24.22
UNIT D-7/24/03	7/24/2003	8:00	36364.3	1.08E+01	6.28E+00	3.59E+00	1.41E+01	2.92E+01	1.61	25.22	14.66	8.38	32.92	68.18
UNIT D-7/28/03	7/28/2003	8:05	36368.3	1.16E+01	6.77E+00	3.72E+00	1.41E+01	2.77E+01	5.62	29.08	16.97	9.33	35.35	69.44
UNIT D-7/29/03	7/29/2003	8:20	36369.3	1.16E+01	6.45E+00	3.52E+00	1.32E+01	2.70E+01	6.63	11.54	6.42	3.50	13.13	26.86
UNIT D/7/30/03	7/30/2003	7:50	36370.3	1.02E+01	5.90E+00	3.18E+00	1.21E+01	2.49E+01	7.61	10.13	5.86	3.16	12.02	24.73
UNIT D-7/31/03	7/31/2003	8:00	36371.3	1.15E+01	6.20E+00	3.31E+00	1.34E+01	2.80E+01	8.61	29.07	15.67	8.37	33.87	70.78
UNIT D-8/4/03	8/4/2003	9:10	36375.4	1.06E+01	6.44E+00	3.47E+00	1.38E+01	2.95E+01	12.66	26.65	16.19	8.72	34.69	74.16
UNIT D-8/5/03	8/5/2003	8:40	36376.4	1.08E+01	6.42E+00	3.30E+00	1.32E+01	2.71E+01	13.64	10.61	6.31	3.24	12.97	26.63
UNIT D-8/6/03	8/6/2003	8:20	36377.3	1.01E+01	5.83E+00	3.10E+00	1.25E+01	2.73E+01	14.63	9.96	5.75	3.06	12.33	26.92
UNIT D-8/7/03	8/7/2003	8:00	36378.3	1.04E+01	5.71E+00	3.01E+00	1.25E+01	2.66E+01	15.61	26.07	14.31	7.55	31.34	66.68
UNIT D-8/11/03	8/11/2003	8:40	36382.4	9.81E+00	5.99E+00	4.04E+00	1.27E+01	2.53E+01	19.64	24.61	15.03	10.14	31.86	63.47
UNIT D-8/12/03	8/12/2003	8:25	36383.4	1.15E+01	6.01E+00	3.76E+00	1.18E+01	2.56E+01	20.63	11.34	5.93	3.71	11.64	25.24
UNIT D-8/13/03	8/13/2003	8:00	36384.3	9.54E+00	5.96E+00	3.74E+00	1.21E+01	2.54E+01	21.61	9.46	5.91	3.71	11.99	25.18
UNIT D-8/14/03	8/14/2003	8:00	36385.3	9.52E+00	6.20E+00	3.96E+00	1.33E+01	2.53E+01	22.61	23.87	15.54	9.93	33.34	63.43
UNIT D-8/18/03	8/18/2003	8:20	36389.3	1.01E+01	6.72E+00	4.56E+00	1.36E+01	2.69E+01	26.63	25.25	16.80	11.40	34.00	67.25
UNIT D-8/19/03	8/19/2003	8:00	36390.3	1.03E+01	6.07E+00	4.03E+00	1.20E+01	2.44E+01	27.61	10.43	6.14	4.08	12.15	24.70
UNIT D-8/20/03	8/20/2003	8:55	36391.4	1.09E+01	5.85E+00	3.77E+00	1.16E+01	2.43E+01	28.65	10.90	5.85	3.77	11.60	24.30

Table C-2. (continued).

ID Number	Sample Date	Sample Time	Decimal Date	Actual Data $CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	Riemann Sums $CHCl_3$ (ppmv*day)	1,1,1-TCA (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
UNIT D-8/21/03	8/21/2003	8:00	36392.3	1.03E+01	6.17E+00	4.00E+00	1.32E+01	2.58E+01	29.61	25.54	15.30	9.92	32.72	63.96
UNIT D-8/25/03	8/25/2003	7:55	36396.3	1.09E+01	6.25E+00	3.25E+00	1.26E+01	2.54E+01	33.61	27.29	15.65	8.14	31.54	63.59
UNIT D-8/26/03	8/26/2003	8:10	36397.3	1.02E+01	5.55E+00	2.92E+00	1.15E+01	2.31E+01	34.62	9.99	5.43	2.86	11.26	22.62
UNIT D-8/27/03	8/27/2003	6:55	36398.3	9.28E+00	5.12E+00	2.79E+00	1.12E+01	2.43E+01	35.57	9.26	5.11	2.79	11.18	24.26
UNIT D-8/28/03	8/28/2003	8:05	36399.3	8.72E+00	5.28E+00	2.99E+00	1.19E+01	2.45E+01	36.62	26.39	15.98	9.05	36.01	74.14
UNIT D-9/2/03	9/2/2003	8:10	36404.3	9.62E+00	6.36E+00	4.77E+00	1.33E+01	2.64E+01	41.62	29.01	19.18	14.38	40.11	79.61
UNIT D-9/3/03	9/3/2003	8:50	36405.4	1.08E+01	7.18E+00	5.06E+00	1.44E+01	2.65E+01	42.65	10.69	7.11	5.01	14.25	26.22
UNIT D-9/4/03	9/4/2003	7:40	36406.3	8.90E+00	5.57E+00	4.13E+00	1.27E+01	2.37E+01	43.60	22.51	14.09	10.45	32.12	59.95
UNIT D-9/8/03	9/8/2003	10:15	36410.4	1.02E+01	6.16E+00	4.74E+00	1.21E+01	3.03E+01	47.71	25.77	15.56	11.97	30.57	76.54
UNIT D-9/9/03	9/9/2003	8:55	36411.4	1.17E+01	6.87E+00	4.81E+00	1.33E+01	3.16E+01	48.65	11.06	6.49	4.55	12.57	29.87
STOP	9/10/2003	7:37	36412.3	1.02E+01	6.38E+00	4.43E+00	1.27E+01	3.04E+01	49.60	4.82	3.02	2.10	6.01	14.38
START	9/10/2003	13:23	36412.6	1.02E+01	6.38E+00	4.43E+00	1.27E+01	3.04E+01	0.00	3.96	2.47	1.72	4.93	11.79
UNIT D-9/11/03	9/11/2003	8:00	36413.3	1.19E+01	9.92E+00	6.85E+00	1.98E+01	3.64E+01	0.78	13.70	11.42	7.88	22.79	41.90
STOP	9/12/2003	20:38	36414.9	1.19E+01	9.92E+00	6.85E+00	1.98E+01	3.64E+01	2.30	9.08	7.57	5.23	15.11	27.78
START	9/15/2003	12:39	36417.5	1.39E+01	1.22E+01	9.18E+00	2.22E+01	4.57E+01	0.00	5.89	5.17	3.89	9.41	19.37
UNIT D-9/16/03	9/16/2003	9:00	36418.4	1.18E+01	8.64E+00	6.66E+00	1.65E+01	3.67E+01	0.85	10.62	7.77	5.99	14.84	33.02
UNIT D-9/17/03	9/17/2003	7:50	36419.3	1.25E+01	7.93E+00	5.52E+00	1.53E+01	4.27E+01	1.80	12.24	7.76	5.41	14.98	41.81
UNIT D-9/18/03	9/18/2003	8:00	36420.3	1.38E+01	1.25E+01	8.50E+00	2.45E+01	4.90E+01	2.81	35.12	31.81	21.63	62.36	124.71
UNIT D-9/22/03	9/22/2003	10:00	36424.4	1.29E+01	9.43E+00	6.12E+00	1.74E+01	3.71E+01	6.89	32.21	23.54	15.28	43.44	92.62
UNIT D-9/23/03	9/23/2003	7:50	36425.3	1.25E+01	7.34E+00	4.90E+00	1.46E+01	3.06E+01	7.80	11.96	7.02	4.69	13.97	29.27
UNIT D-9/24/03	9/24/2003	7:55	36426.3	1.11E+01	7.26E+00	4.70E+00	1.42E+01	3.13E+01	8.80	33.42	21.86	14.15	42.75	94.23
STOP	9/29/2003	8:20	36431.3	1.14E+01	7.52E+00	5.02E+00	1.55E+01	3.14E+01	13.82	28.60	18.87	12.59	38.88	78.77
START	9/29/2003	11:26	36431.5	1.14E+01	7.52E+00	5.02E+00	1.55E+01	3.14E+01	0.00	10.74	7.09	4.73	14.61	29.59
UNIT D-10/1/03	10/1/2003	8:40	36433.4	1.16E+01	8.23E+00	6.01E+00	1.53E+01	3.40E+01	1.88	16.57	11.76	8.59	21.86	48.57
UNIT D-10/2/03	10/2/2003	8:00	36434.3	1.08E+01	6.91E+00	5.16E+00	1.46E+01	3.49E+01	2.86	26.62	17.04	12.72	35.99	86.04
UNIT D-10/6/03	10/6/2003	7:00	36438.3	1.16E+01	7.96E+00	3.65E+00	1.63E+01	4.38E+01	6.82	28.92	19.84	9.10	40.64	109.20
UNIT D-10/7/03	10/7/2003	7:40	36439.3	1.17E+01	6.95E+00	3.05E+00	1.41E+01	4.14E+01	7.84	12.23	7.26	3.19	14.74	43.27
UNIT D-10/8/03	10/8/2003	9:10	36440.4	1.14E+01	7.19E+00	3.08E+00	1.55E+01	5.27E+01	8.91	11.48	7.24	3.10	15.61	53.07
UNIT D-10/9/03	10/9/2003	8:00	36441.3	1.10E+01	7.11E+00	3.26E+00	1.60E+01	4.52E+01	9.86	27.45	17.74	8.14	39.93	112.80

Table C-2. (continued).

ID Number	Sample Date	Sample Time	Decimal Date	Actual Data $CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	Riemann Sums $CHCl_3$ (ppmv*day)	1,1,1-TCA (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
UNIT D-10/13/03	10/13/2003	8:57	36445.4	1.26E+01	9.24E+00	7.81E+00	1.75E+01	4.62E+01	13.90	31.41	23.04	19.47	43.63	115.18
UNIT D-10/14/03	10/14/2003	7:40	36446.3	1.51E+01	1.13E+01	7.84E+00	2.24E+01	5.24E+01	14.84	15.11	11.31	7.85	22.42	52.44
UNIT D-10/15/03	10/15/2003	8:59	36447.4	1.37E+01	9.09E+00	6.00E+00	1.85E+01	5.07E+01	15.90	13.80	9.15	6.04	18.63	51.05
UNIT D-10/16/03	10/16/2003	8:00	36448.3	1.45E+01	9.74E+00	6.01E+00	2.09E+01	6.15E+01	16.86	35.95	24.15	14.90	51.82	152.49
UNIT D-10/20/03	10/20/2003	8:00	36452.3	1.51E+01	1.09E+01	8.72E+00	2.13E+01	5.44E+01	20.86	37.75	27.25	21.80	53.25	136.00
UNIT D-10/21/03	10/21/2003	8:00	36453.3	1.57E+01	1.10E+01	7.98E+00	2.15E+01	5.06E+01	21.86	15.67	10.98	7.97	21.46	50.51
UNIT D-10/22/03	10/22/2003	7:55	36454.3	1.41E+01	9.02E+00	6.26E+00	1.86E+01	4.37E+01	22.85	7.34	4.70	3.26	9.69	22.76
STOP	10/22/2003	9:00	36454.4	1.41E+01	9.02E+00	6.26E+00	1.86E+01	4.37E+01	22.90	0.32	0.20	0.14	0.42	0.99
START	10/22/2003	14:00	36454.6	1.34E+01	8.43E+00	5.54E+00	1.82E+01	4.76E+01	0.00	5.03	3.16	2.08	6.83	17.85
UNIT D-10/23/03	10/23/2003	8:00	36455.3	1.34E+01	8.43E+00	5.54E+00	1.82E+01	4.76E+01	0.75	34.06	21.43	14.08	46.26	120.98
UNIT D-10/27/03	10/27/2003	16:00	36459.7	1.36E+01	9.80E+00	8.34E+00	1.82E+01	5.04E+01	5.08	33.73	24.31	20.68	45.14	125.00
STOP	10/28/2003	7:03	36460.3	1.48E+01	9.67E+00	5.95E+00	1.95E+01	6.35E+01	5.71	4.64	3.03	1.87	6.11	19.91
START	10/28/2003	9:45	36460.4	1.48E+01	9.67E+00	5.95E+00	1.95E+01	6.35E+01	0.00	6.83	4.47	2.75	9.01	29.32
UNIT D-10/29/03	10/29/2003	7:55	36461.3	1.52E+01	1.01E+01	5.84E+00	2.08E+01	8.55E+01	0.92	14.65	9.73	5.63	20.04	82.38
UNIT D-10/30/03	10/30/2003	8:00	36462.3	2.32E+01	1.57E+01	7.06E+00	3.56E+01	1.56E+02	1.93	58.60	39.66	17.83	89.93	394.06
UNIT D-11/3/03	11/3/2003	9:10	36466.4	2.23E+01	1.38E+01	9.39E+00	2.97E+01	1.00E+02	5.98	55.83	34.55	23.51	74.35	250.35
UNIT D-11/4/03	11/4/2003	8:10	36467.3	2.39E+01	1.43E+01	7.76E+00	3.16E+01	1.08E+02	6.93	23.57	14.10	7.65	31.16	106.50
UNIT D-11/5/03	11/5/2003	8:30	36468.4	2.68E+01	1.82E+01	1.22E+01	3.70E+01	1.07E+02	7.95	26.71	18.14	12.16	36.87	106.63
UNIT D-11/6/03	11/6/2003	8:00	36469.3	2.69E+01	1.90E+01	1.20E+01	3.96E+01	9.96E+01	8.93	71.83	50.73	32.04	105.74	265.95
UNIT D-11/10/03	11/10/2003	16:40	36473.7	2.21E+01	1.32E+01	1.01E+01	2.84E+01	8.93E+01	13.29	55.33	33.05	25.29	71.10	223.56
UNIT D-11/11/03	11/11/2003	8:10	36474.3	2.06E+01	1.20E+01	8.12E+00	2.63E+01	8.35E+01	13.93	16.84	9.81	6.64	21.51	68.28
UNIT D-11/12/03	11/12/2003	7:55	36475.3	2.62E+01	1.86E+01	1.20E+01	3.76E+01	1.11E+02	14.92	26.11	18.54	11.96	37.47	110.61
UNIT D-11/13/03	11/13/2003	8:00	36476.3	2.07E+01	1.26E+01	8.27E+00	2.86E+01	7.40E+01	15.93	55.42	33.73	22.14	76.56	198.10
UNIT D-11/17/03	11/17/2003	16:25	36480.7	2.35E+01	1.40E+01	7.30E+00	3.07E+01	1.27E+02	20.28	58.75	35.00	18.25	76.75	317.50
UNIT D-11/18/03	11/18/2003	8:00	36481.3	2.40E+01	1.73E+01	9.85E+00	3.50E+01	1.10E+02	20.93	19.46	14.03	7.99	28.38	89.18
UNIT D-11/19/03	11/19/2003	7:20	36482.3	2.45E+01	1.71E+01	9.99E+00	3.62E+01	9.11E+01	21.90	24.50	17.10	9.99	36.20	91.10
UNIT D-11/20/03	11/20/2003	8:00	36483.3	2.38E+01	1.32E+01	6.63E+00	3.10E+01	1.04E+02	22.93	59.83	33.18	16.67	77.93	261.44
UNIT D-11/24/03	11/24/2003	8:00	36487.3	2.54E+01	1.57E+01	1.08E+01	3.36E+01	9.00E+01	26.93	63.32	39.14	26.92	83.77	224.37
UNIT D-11/25/03	11/25/2003	7:40	36488.3	2.65E+01	1.49E+01	8.38E+00	3.36E+01	1.13E+02	27.91	26.50	14.90	8.38	33.60	113.00

Table C-2. (continued).

ID Number	Sample Date	Sample Time	Decimal Date	Actual Data $CHCl_3$ (ppmv)	TCA (ppmv)	PCE (ppmv)	TCE (ppmv)	CCl_4 (ppmv)	Number of Days	Riemann Sums $CHCl_3$ (ppmv*day)	1,1,1-TCA (ppmv*day)	PCE (ppmv*day)	TCE (ppmv*day)	CCl_4 (ppmv*day)
UNIT D-11/26/03	11/26/2003	8:00	36489.3	2.74E+01	1.47E+01	7.46E+00	3.53E+01	1.23E+02	28.93	82.53	44.28	22.47	106.33	370.49
UNIT D-12/1/03	12/1/2003	8:15	36494.3	2.23E+01	1.35E+01	9.23E+00	2.76E+01	8.61E+01	33.94	66.82	40.45	27.66	82.70	258.00
UNIT D-12/2/03	12/2/2003	7:50	36495.3	3.03E+01	1.78E+01	1.01E+01	3.73E+01	1.19E+02	34.92	29.83	17.52	9.94	36.72	117.14
UNIT D-12/3/03	12/3/2003	7:30	36496.3	2.73E+01	1.61E+01	9.53E+00	3.56E+01	9.89E+01	35.91	27.39	16.16	9.56	35.72	99.24
UNIT D-12/4/03	12/4/2003	8:00	36497.3	2.95E+01	1.80E+01	1.05E+01	3.93E+01	1.11E+02	36.93	73.75	45.00	26.25	98.25	277.50
UNIT D-12/8/03	12/8/2003	7:30	36501.3	2.93E+01	1.68E+01	1.00E+01	3.64E+01	1.47E+02	40.91	73.10	41.91	24.95	90.81	366.73
UNIT D-12/9/03	12/9/2003	7:45	36502.3	3.34E+01	2.23E+01	1.37E+01	4.72E+01	1.40E+02	41.92	33.52	22.38	13.75	47.36	140.49
UNIT D-12/10/03	12/10/2003	7:40	36503.3	2.78E+01	1.55E+01	9.33E+00	3.54E+01	1.04E+02	42.91	27.94	15.58	9.38	35.58	104.54
UNIT D-12/11/03	12/11/2003	8:00	36504.3	3.17E+01	1.71E+01	8.90E+00	4.04E+01	1.36E+02	43.93	79.47	42.87	22.31	101.28	340.94
UNIT D-12/15/03	12/15/2003	8:00	36508.3	2.74E+01	1.69E+01	1.07E+01	3.53E+01	1.22E+02	47.93	68.79	42.43	26.86	88.62	306.27
UNIT D-12/16/03	12/16/2003	8:30	36509.4	3.44E+01	2.53E+01	1.74E+01	5.20E+01	1.23E+02	48.95	34.40	25.30	17.40	52.00	123.00
UNIT D-12/17/03	12/17/2003	8:00	36510.3	3.44E+01	2.18E+01	1.38E+01	4.43E+01	1.04E+02	49.93	34.04	21.57	13.66	43.84	102.92
UNIT D-12/18/03	12/18/2003	8:00	36511.3	2.94E+01	1.91E+01	1.28E+01	4.14E+01	8.97E+01	50.93	74.05	48.11	32.24	104.28	225.93
STOP	12/22/2003	8:54	36515.4	3.11E+01	2.06E+01	1.50E+01	4.22E+01	1.27E+02	54.96	62.78	41.59	30.28	85.19	256.38
START	12/22/2003	16:38	36515.7	3.11E+01	2.06E+01	1.50E+01	4.22E+01	1.27E+02	0.00	0.89	0.59	0.43	1.20	3.62
STOP	12/22/2003	18:00	36515.8	3.11E+01	2.06E+01	1.50E+01	4.22E+01	1.27E+02	0.06	0.89	0.59	0.43	1.20	3.62
START	12/23/2003	12:50	36516.5	3.71E+01	2.69E+01	1.79E+01	5.41E+01	1.37E+02	0.00	2.06	1.49	0.99	3.01	7.61
UNIT D-12/23/03	12/23/2003	15:30	36516.6	3.71E+01	2.69E+01	1.79E+01	5.41E+01	1.37E+02	0.11	14.56	10.55	7.02	21.23	53.75
UNIT D-12/24/03	12/24/2003	7:40	36517.3	3.11E+01	1.78E+01	1.14E+01	4.03E+01	1.24E+02	0.78	129.90	74.35	47.61	168.32	517.92
STOP	12/31/2003	23:59	36525.0	3.11E+01	1.78E+01	1.14E+01	4.03E+01	1.24E+02	8.46	119.42	68.35	43.78	154.75	476.15
								Total days	175.00	3017	1891	1182	4018	11002
								avg/day		17	11	7	23	63
								(ft^3)		1738	1089	681	2315	6337
								n		2009	1259	787	2675	7325
								(lb)		529	370	288	775	2484
								Total (lb)		4446		Total hours	4200.12	

CCl_4 = carbon tetrachloride $CHCl_3$ = chloroform PCE = tetrachloroethylene TCA = trichloroethane TCE = trichloroethylene

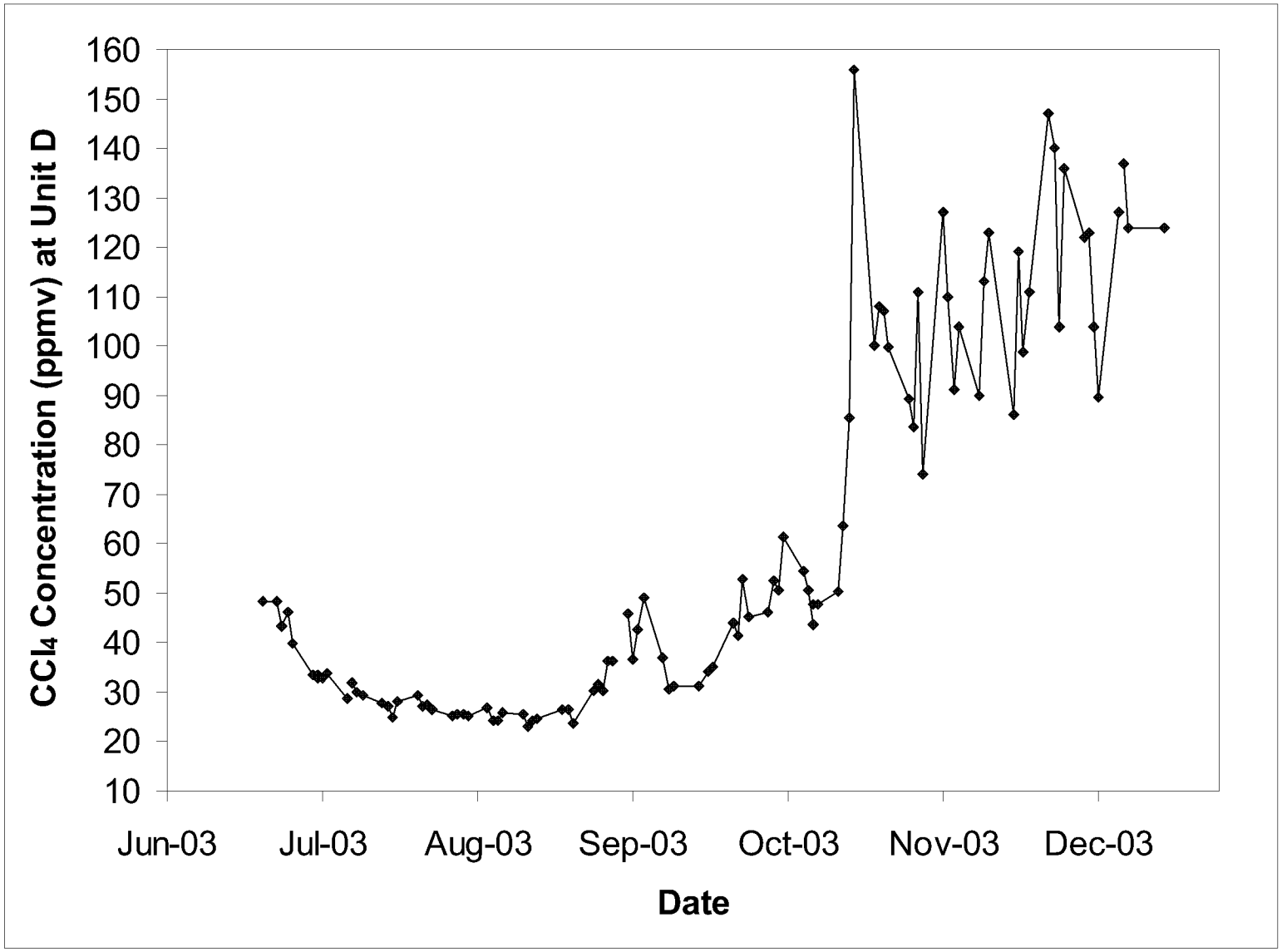

Figure C-2. Unit D end-year 2003 inlet carbon tetrachloride sample concentration.

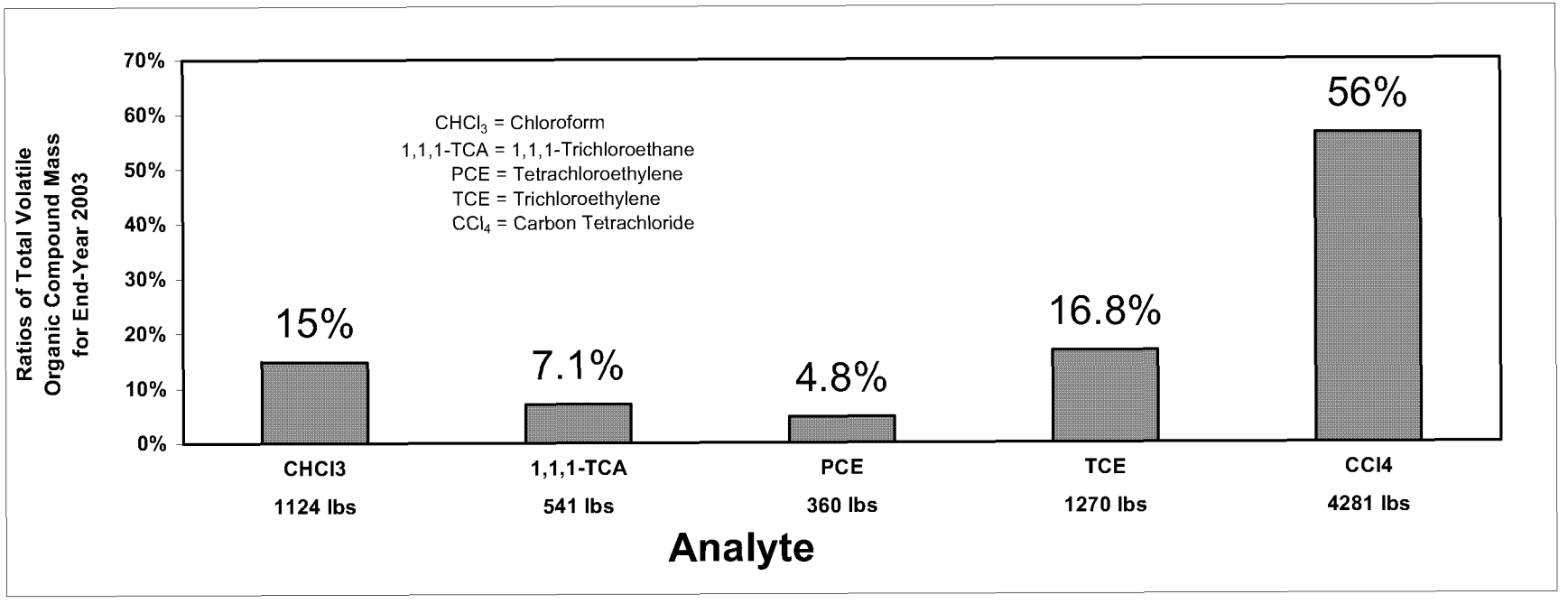

Figure C-3. Analyte mass contribution to total volatile organic compound mass during the end-year 2003 reporting period.

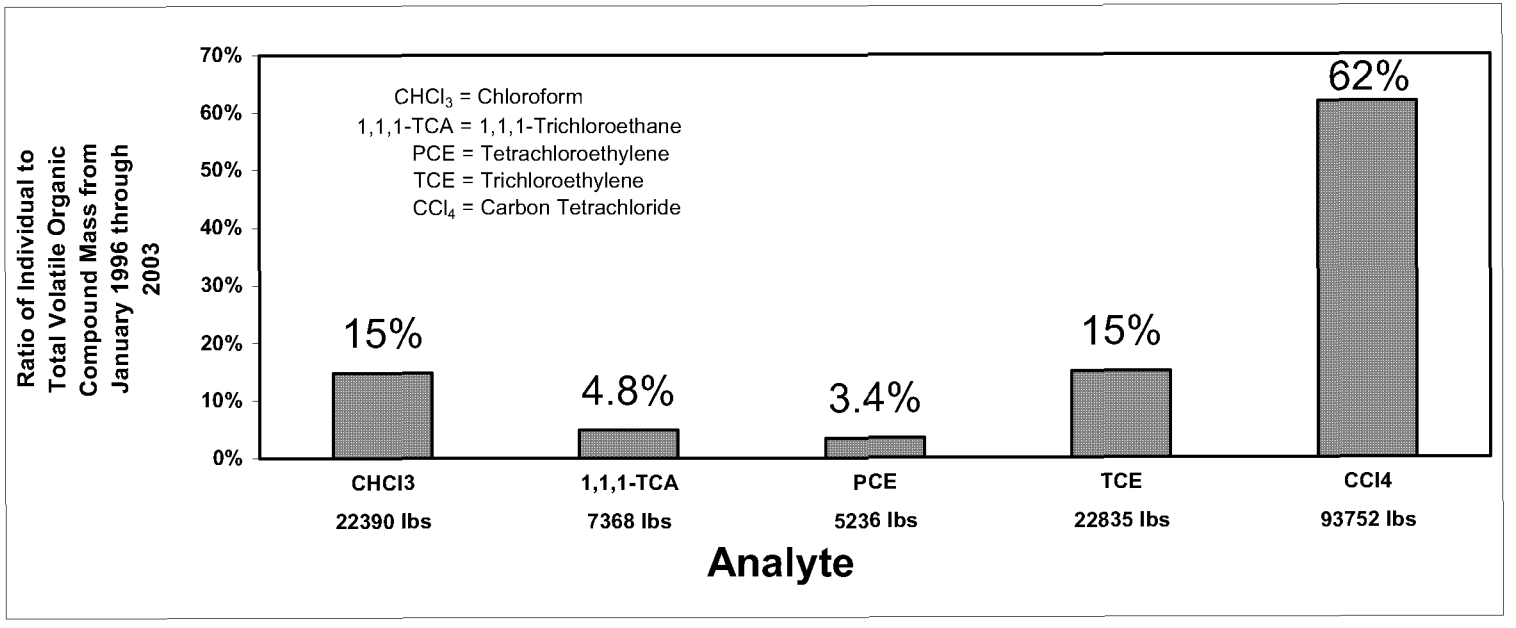

Figure C-4. Analyte mass contribution to total volatile organic compound mass removed (January 1996 through December 2003).

Table C-3. Breakdown per operating cycle of the mass of contaminants removed through December 2003.

Operating Period	Year	$CHCl_3$ (kg)	TCA (kg)	PCE (kg)	TCE (kg)	CCl_4 (kg)	Total (kg)
First 8 weeks	1996	510	151	106	461	2,277	3,505
Percentage of total		15%	4%	3%	13%	65%	
Second 8 weeks	1996	258	80	64	247	1,203	1,853
Percentage of total		14%	4%	3%	13%	65%	
Third 8 weeks	1996	169	51	36	151	753	1,159
Percentage of total		15%	4%	3%	13%	65%	
First quarter	1997	196	48	28	142	857	1,270
Percentage of total		15%	4%	2%	11%	67%	
Second quarter	1997	497	165	134	494	2,393	3,684
Percentage of total		13%	4%	4%	13%	65%	
Third quarter	1997	291	54	65	273	1,266	1,949
Percentage of total		15%	3%	3%	14%	65%	
Fourth quarter	1997	547	155	110	449	2,452	3,713
Percentage of total		15%	4%	3%	12%	66%	
Midyear	1998	489	153	112	436	2,147	3,337
Percentage of total		15%	5%	3%	13%	64%	
End-Year	1998	674	175	191	714	2,768	4,523
Percentage of total		15%	4%	4%	16%	61%	
Midyear	1999	378	98	74	404	1,860	2,814
Percentage of total		13%	4%	3%	14%	66%	
End-Year	1999	514	178	163	637	2,490	3,982
Percentage of total		13%	4%	4%	16%	63%	
Midyear	2000	528	149	139	608	2,414	3,838
Percentage of total		14%	4%	4%	16%	63%	
End-Year	2000	286	58	31	257	1,331	1964
Percentage of total		14%	3%	2%	13%	68%	
Midyear	2001	697	123	147	612	2,795	4,374
Percentage of total		16%	3%	3%	14%	64%	
End-Year	2001	777	232	151	837	3,320	5,317
Percentage of total		15%	4%	3%	16%	62%	
Midyear	2002	937	438	234	1,082	3,576	6,267
Percentage of total		15%	7%	4%	17%	57%	
End-Year	2002	1094	461	243	1141	3846	6785
Percentage of total		16%	7%	4%	17%	57%	
Midyear	2003	804	328	184	836	2835	4987
Percentage of total		16%	7%	4%	17%	57%	
End-Year		510	245	163	577	1942	3437
Percentage of total	2003	15%	7%	5%	17%	57%	
Total 1996–December 2003		10,156	3,342	2,375	10,358	42,525	68,756
Percentage of total		15%	5%	3%	15%	62%	

CCl_4 = carbon tetrachloride $CHCl_3$ = chloroform PCE = tetrachloroethylene TCA = trichloroethane TCE = trichloroethylene

Appendix D

Spatial and Temporal Distribution of Volatile Organic Compounds in the Vadose Zone

Appendix D

Spatial and Temporal Distribution of Volatile Organic Compounds in the Vadose Zone

Figures D-1 through D-5 represent a horizontal cross section of the distribution of the CCl_4 concentration in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface. Concentration values from five different sampling events were used to prepare the plots: before starting the remedial action in January 1996, January 1998, January 2000, January 2002, and December 2003. The CCl_4 concentration distribution was kriged by using the Environmental Visualization System software program. Plots of current CCl_4 vapor data, at approximately 21 m (70 ft) deep, indicate an increase since January 2002, but an overall decrease in the areal extent of the plume when compared to data taken before operations at the same depth. Current increased levels of CCl_4 are likely the result of a rebound response when Units A and B were shut down. The vapor data generally indicate a decrease in the CCl_4 concentration at the center of the plume when compared to data taken before operations.

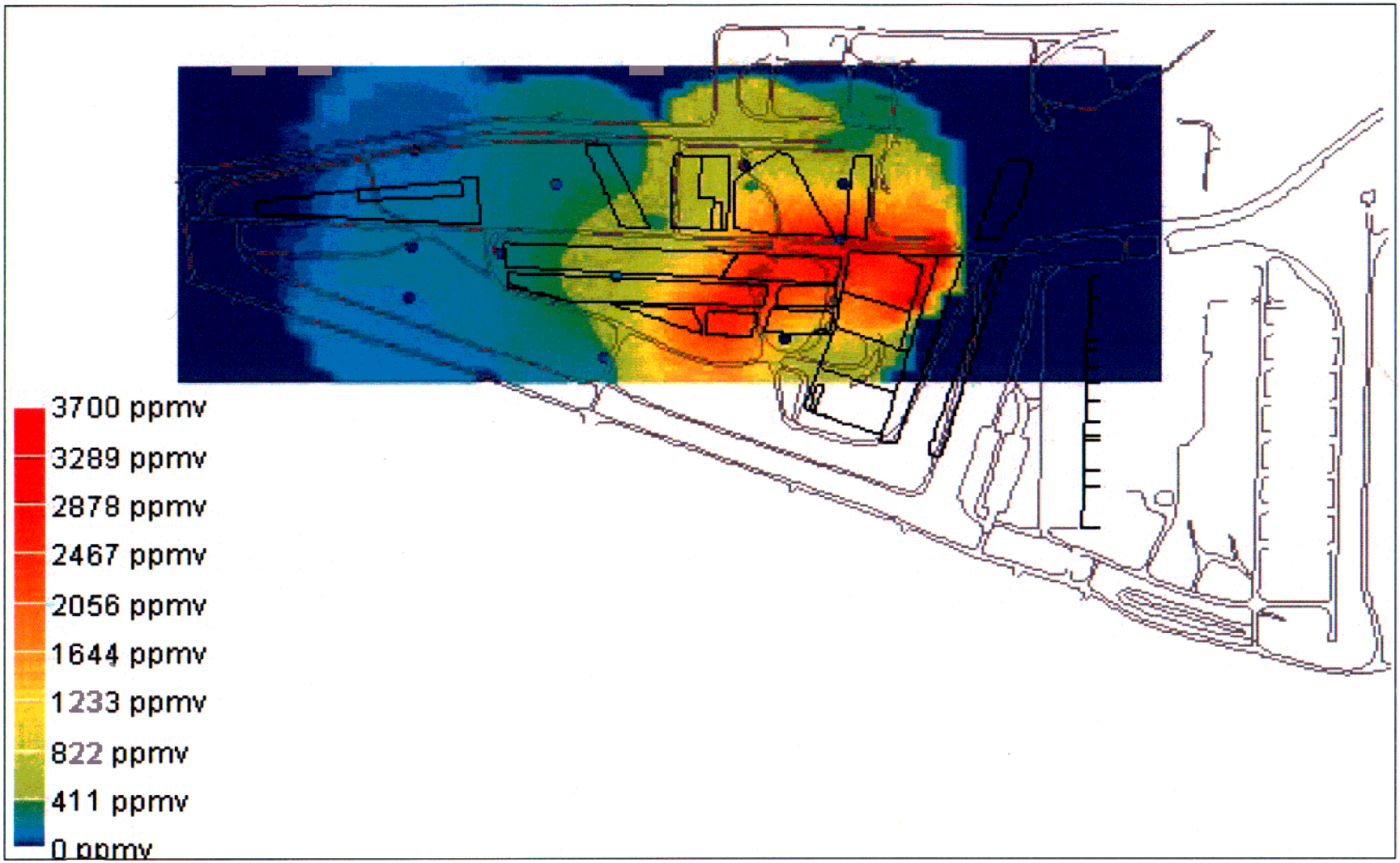

Figure D-1. Spatial distribution of volatile organic compounds in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface in January 1996.

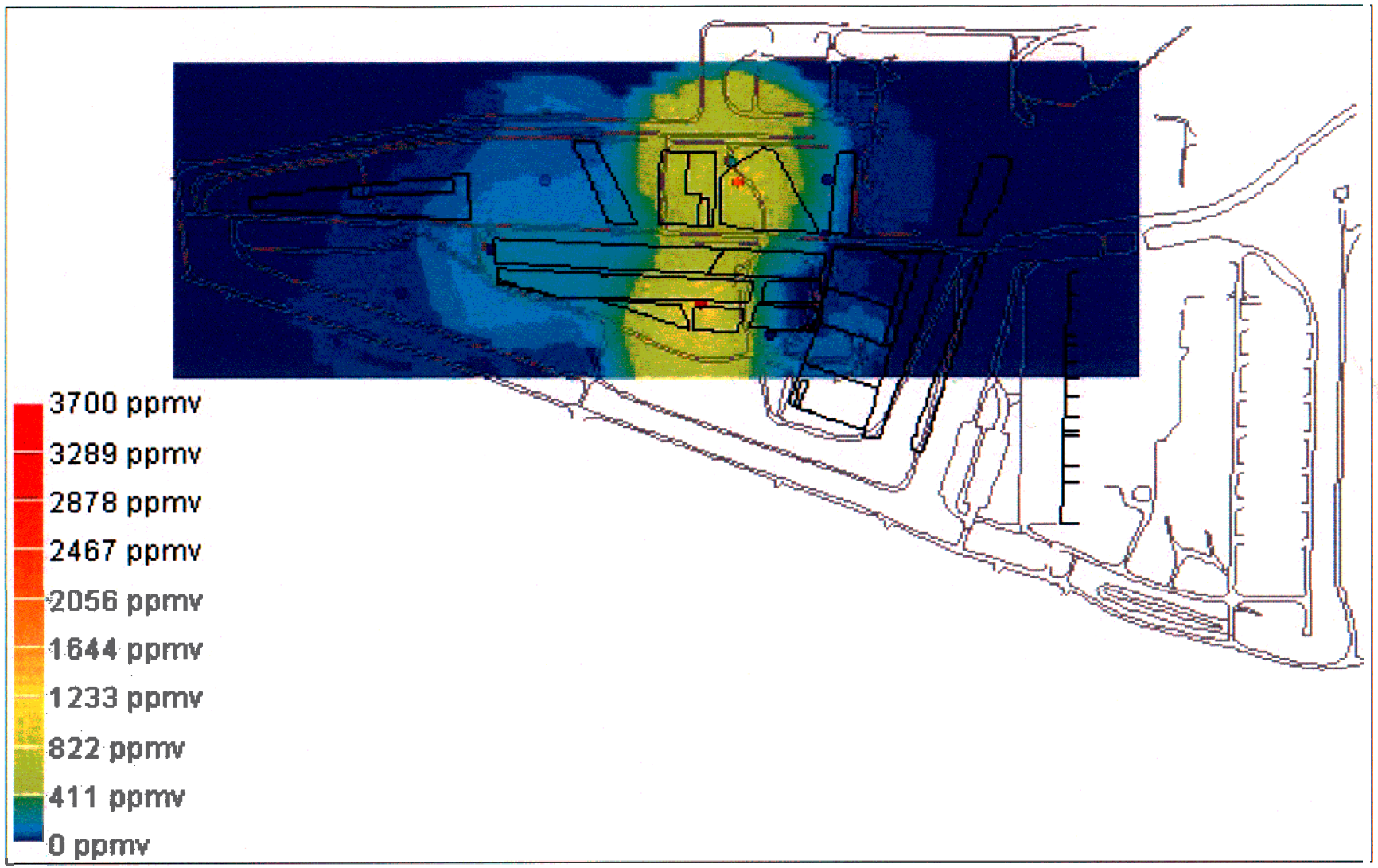

Figure D-2. Spatial distribution of volatile organic compounds in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface in January 1998.

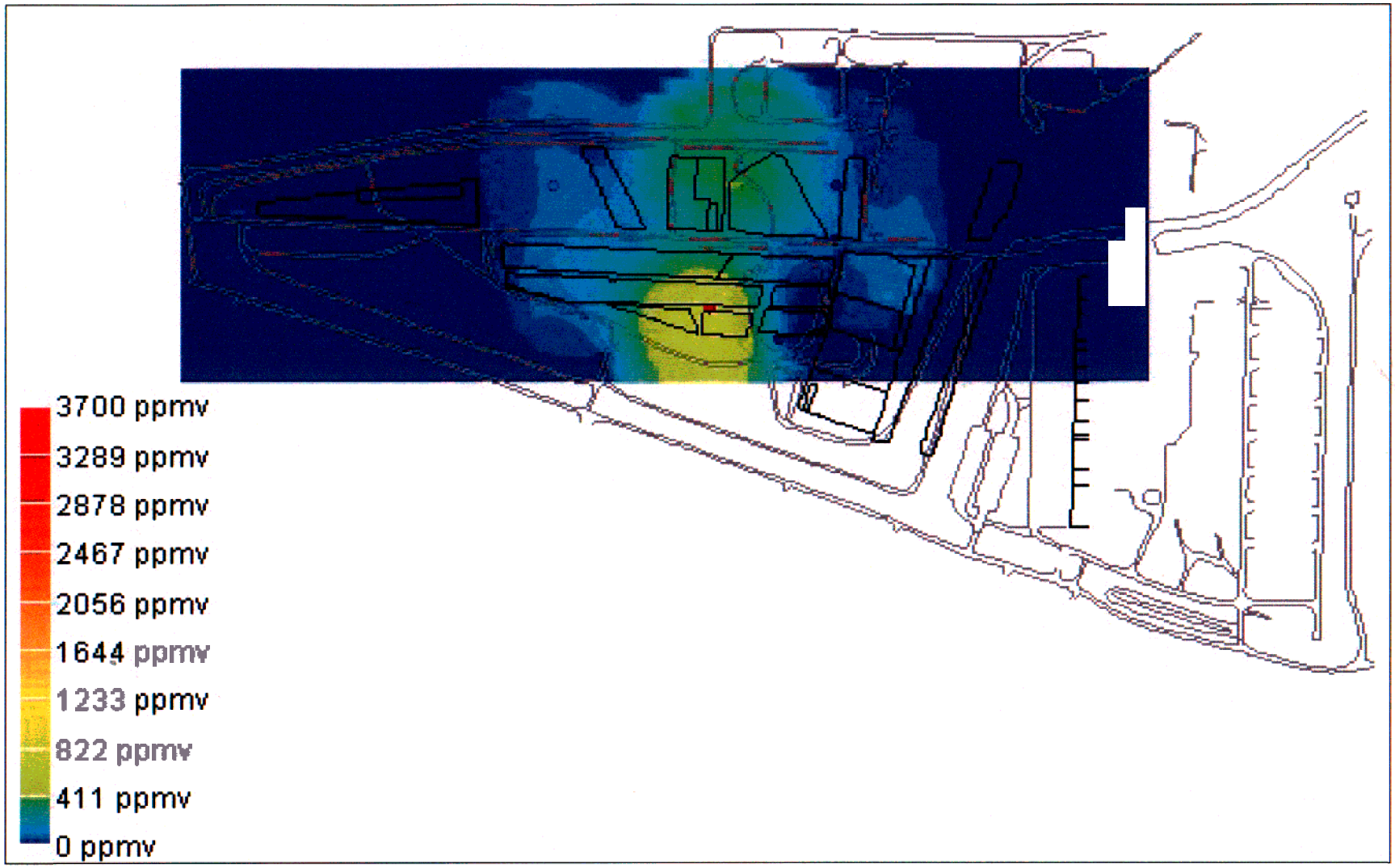

Figure D-3. Spatial distribution of volatile organic compounds in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface in January 2000.

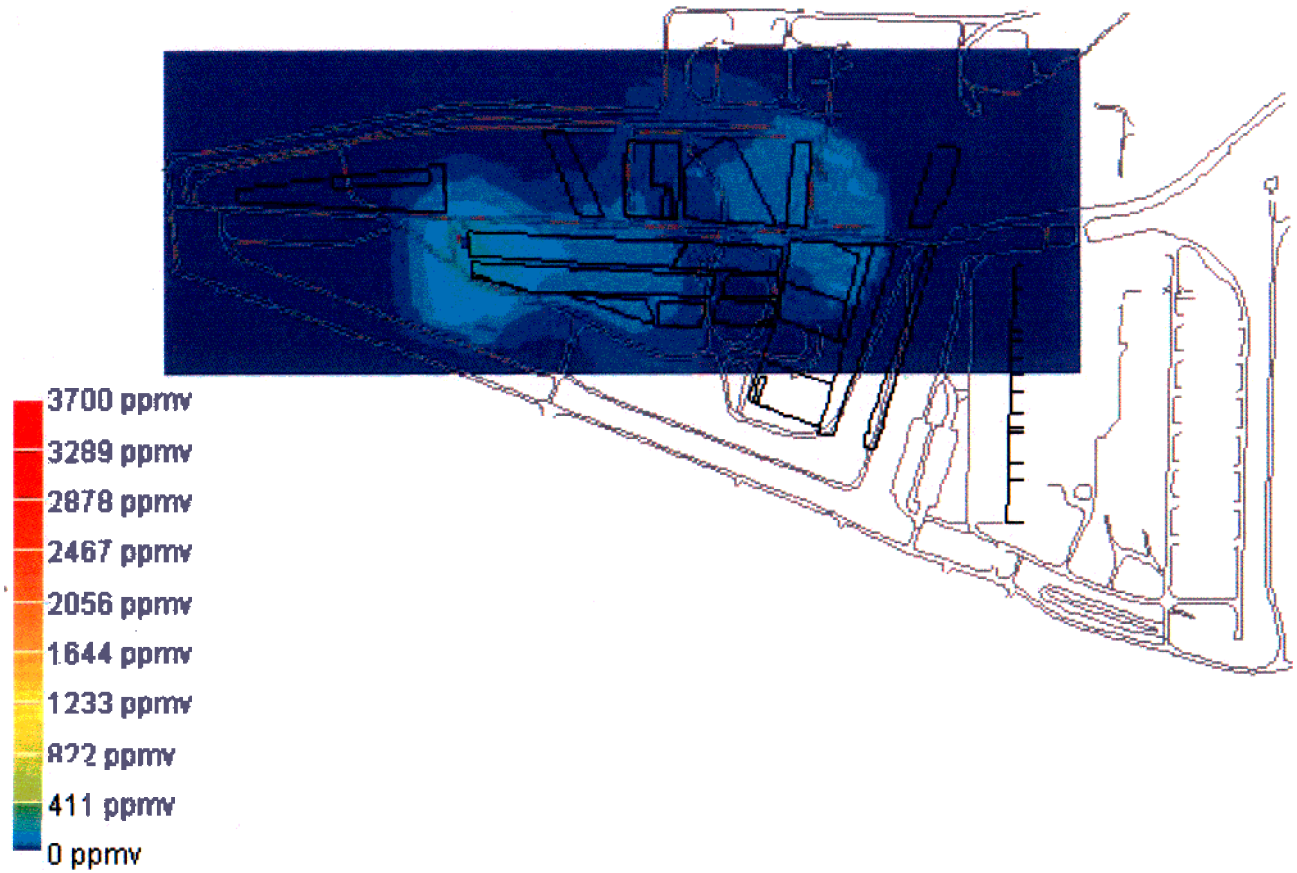

Figure D-4. Spatial distribution of volatile organic compounds in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface in January 2002.

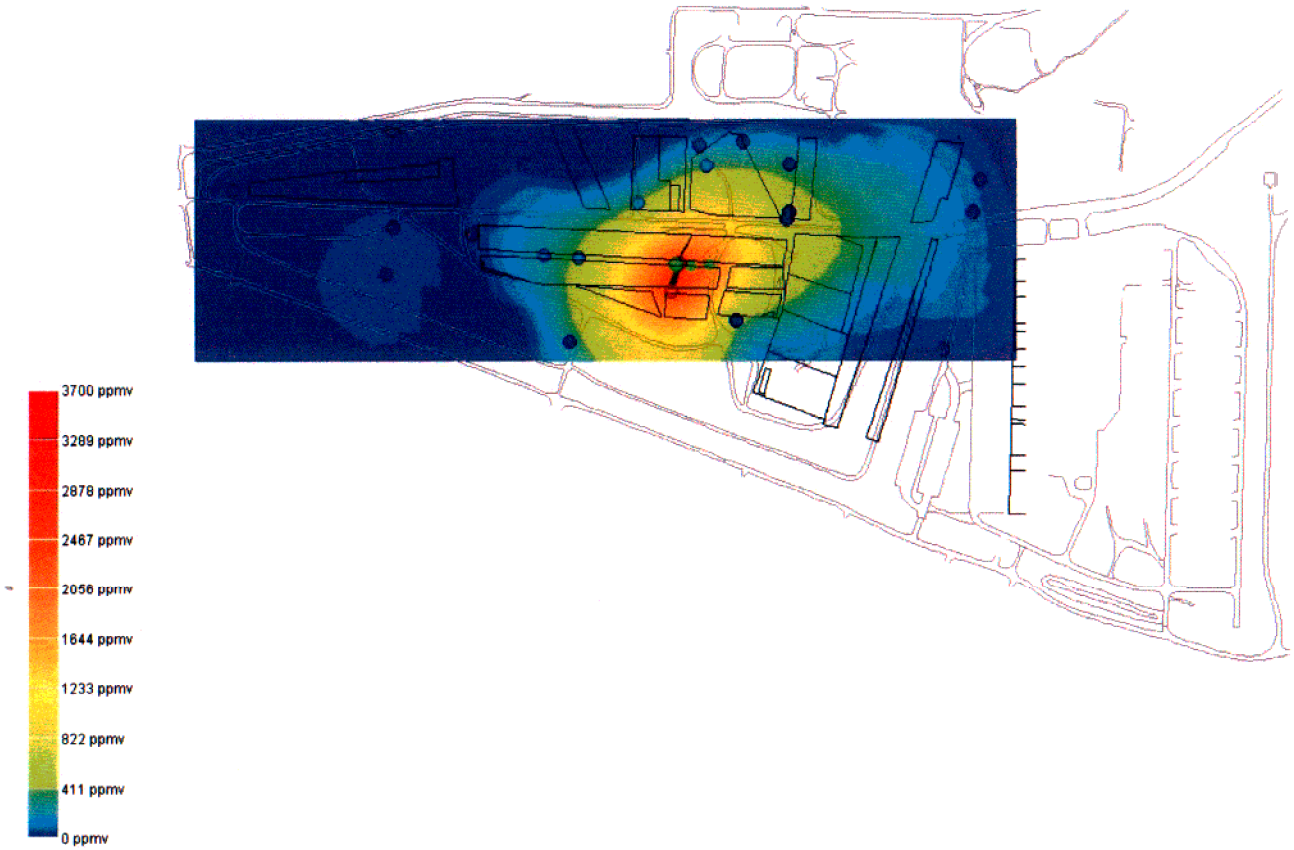

Figure D-5. Spatial distribution of volatile organic compounds in the Subsurface Disposal Area at approximately 21 m (70 ft) below ground surface in December 2003.

Appendix E

Operations History of Vacuum Vapor Extraction with Treatment Units at the Subsurface Disposal Area

Appendix E

Operations History of Vacuum Vapor Extraction with Treatment Units at the Subsurface Disposal Area

During the end-year 2003 operations period, a goal of 80% uptime of available hours was set for operation of the Vacuum Vapor Extraction with Treatment (VVET) units at the Subsurface Disposal Area including planned downtime for maintenance activities. Units A and D achieved uptimes of 100 and 99.5% of available hours, respectively. Figures E-1 and E-2 show the operation histories of both VVET units during the end-year 2003 operational period. Table E-1 shows the cumulative operating schedule for VVET operations from January 1996 through December 2003.

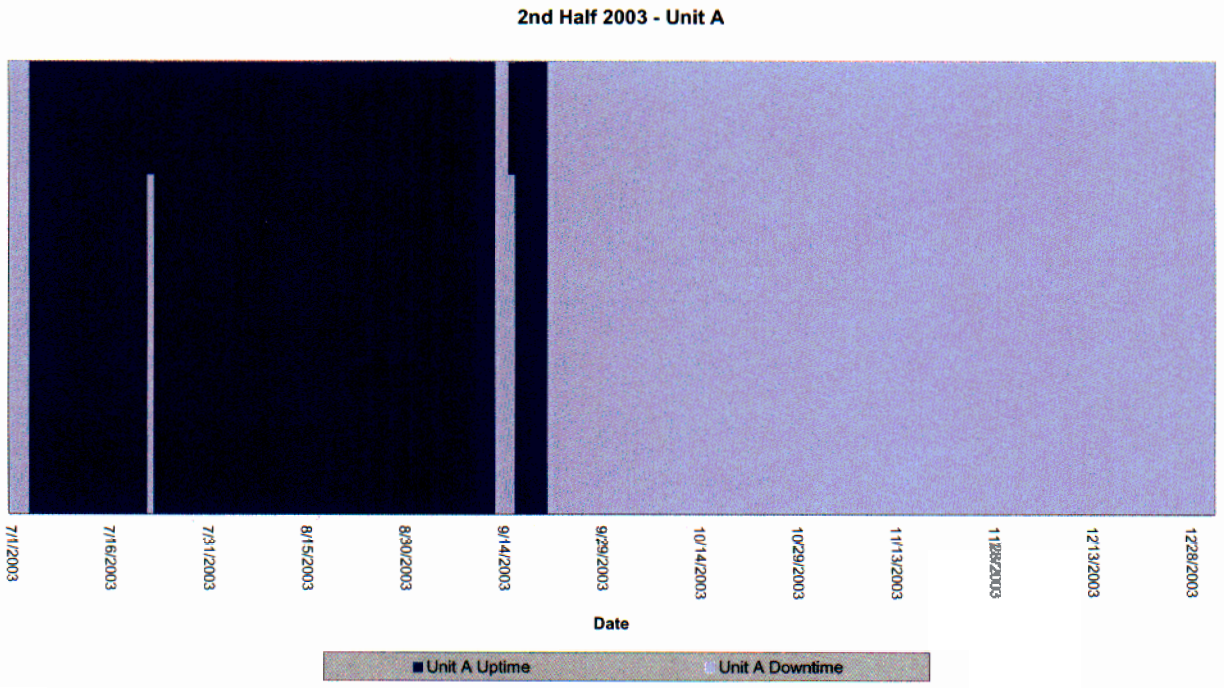

Figure E-1. Operation history of vapor vacuum extraction with treatment Unit A for end-year 2003.

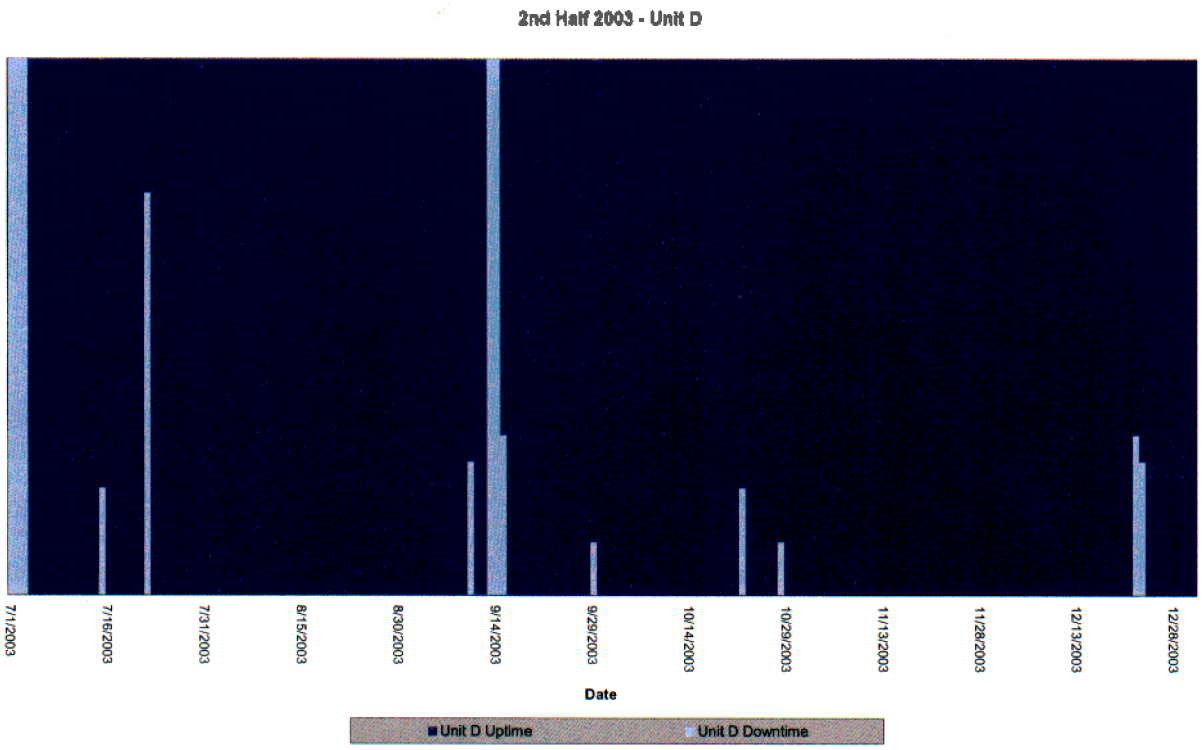

Figure E-2. Operation history of vapor vacuum extraction with treatment Unit D for end-year 2003.

Table E-1. Cumulative operating schedule for vapor vacuum extraction with treatment operations through December 2003.

Operating Period	Year	Unit A	Unit B	Unit C	Unit D
First 8 weeks	1996				
Hours operated		1,321	1,137	1,102	
Hours available		1,602	1,437	1,265	
Percent operated		82%	79%	87%	
Second 8 weeks	1996				
Hours operated		916	614	915	
Hours available		994	971	994	
Percent operated		92%	63%	92%	
Third 8 weeks	1996				
Hours operated		750	640	752	
Hours available		1,008	864	1,056	
Percent operated		74%	74%	71%	
First quarter	1997				
Hours operated		120	744	1056	
Hours available		2,952	2,952	2,952	
Percent operated		4%	25%	36%	

Table E-1. (continued).

Operating Period	Year	Unit A	Unit B	Unit C	Unit D
Second quarter	1997				
Hours operated		899	1,223	1,355	
Hours available		1,023	1,531	1,633	
Percent operated		88%	80%	83%	
Third quarter	1997				
Hours operated		824	764	898	
Hours available		954	817	912	
Percent operated		86%	94%	98%	
Fourth quarter	1997				
Hours operated		2,776	2,677	160	
Hours available		2,845	2,840	2,848	
Percent operated		98%	94%	6%	
Midyear	1998				
Hours operated		2,821	2,639	0	
Hours available		2,880	2,880	2,880	
Percent operated		98%	92%	0%	
End-Year	1998				
Hours operated		3,809	3,713	0	
Hours available		4,200	4,152	4,104	
Percent operated		91%	90%	0%	
Midyear	1999				
Hours operated		3,162	305	0	
Hours available		4,152	407	4,152	
Percent operated		76%	75%	0%	
End-Year	1999				
Hours operated		3,120	2,544	2,424	
Hours available		3,432	3,432	3,432	
Percent operated		91%	74%	71%	
Midyear	2000				
Hours operated		3,520	3,236	1,938	
Hours available		4,032	4,032	4,032	
Percent operated		87%	80%	48%	
End-Year	2000				
Hours operated		2,325	0	Unit C failed in spring 2000	
Hours available		3,144	3,144		
Percent operated		74%	0%		

Table E-1. (continued).

Operating Period	Year	Unit A	Unit B	Unit C	Unit D
Midyear	2001				
Hours operated		2,440	624	Unit C replaced with Unit D in spring 2001	
Hours available		4,008	4,008		
Percent operated		61%	16%		
End-Year	2001				Unit D shake down period
Hours operated		3,049	3,712		
Hours available		4,080	4,080		
Percent operated		75%	91%		
Midyear	2002				Shakedown complete 3/4/02
Hours operated		3,067	3,228		792
Calendar hours		3,258	3,258		2,142
Percent operated		94%	99%		37%
End-Year	2002				
Hours operated		3,743	3,947		3,931
Calendar hours		4,416	4,416		4,416
Percent operated		85%	89.40%		89%
Midyear	2003				
Hours operated		3,621	710		2,424
Calendar hours		4,344	1,018		4,344
Percent operated		83%	70%		56%
End-Year	2003				
Hours operated		1,897			4,200
Calendar hours		2,073			4,416
Percent operated		92%			95%
Totals					
Hours operated		44,180	32,457	10,600	11,347
Calendar hours		55,397	46,239	30,260	15,318
Percent of calendar hours operated		79.75%	70.19%	35.03%	74.08%